DRAGON USER



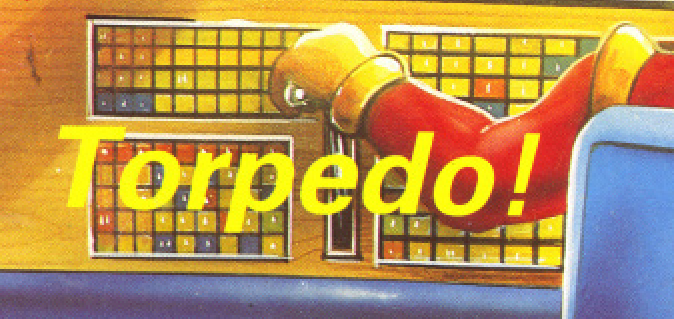
The independent Dragon magazine

95p US$3.25 December 1985

Two dimensional graphics

Machine code made simple

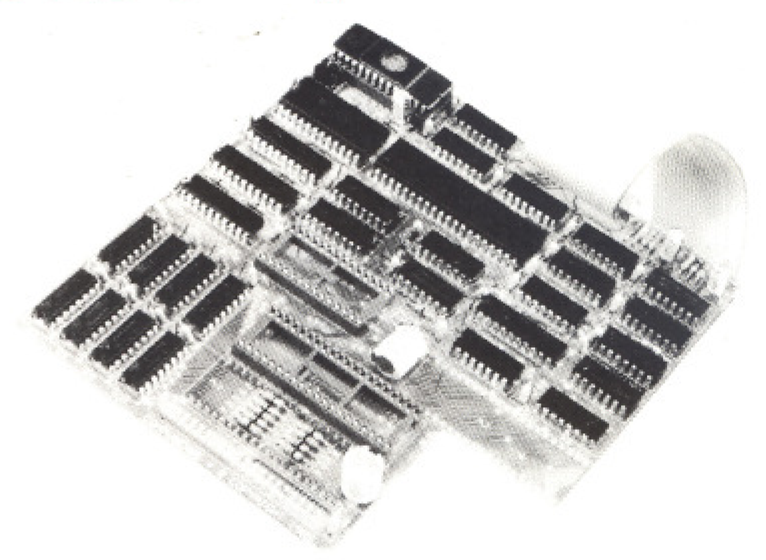
Torpedo!



Digital Dragons

WIN Microdeal's Trekboer!

The DRAGON PLUS Expansion



Upgrade your DRAGON 32 or 64 with an extra 64K of dynamic RAM and a fast, high quality 80 by 24 display with it's own 2K video RAM. DRAGON PLUS is easily fitted inside your DRAGON and provides a completely independent video with an additional monitor socket. Existing software works as normal. A new version of FLEX is available with RAM disk and printer spooling.

Assembled and tested — Ready to install (please specify Dragon 32 or 64) Installation service available	£103.50
Update disk for FLEX/DBASIC/EDIT+ (registered owners only)	£5.75
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EDIT+ cartridge for DRAGONPLUS	£25.00
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CUMANA DISK DRIVES for the DRAGON 32/64

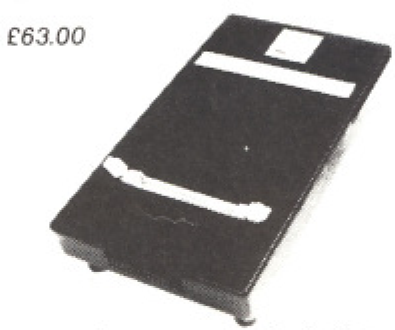
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Use a terminal instead of the DRAGON keyboard and screen

MODEM CABLE for use with RS232 INTERFACE

£19.50

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Turn your DRAGON into an intelligent EPROM Programmer just by plugging into the expansion port. This Programmer is totally software controlled and allows BASIC functions to be used and BASIC programs to be run to created data to be put into EPROM. All the EPROM Programming functions are selected from a MENU:

VERIFY, LOAD, PROGRAM, EMPTY CHECK, EXAMINE/CHANGE BUFFER, CLEAR, FILL BUFFER, LIST TO SCREEN/PRINTER, SET ADDRESS LIMITS, LOAD FROM MEMORY, SELECT EPROM TYPE, MOVE MEMORY, EXIT TO BASIC

EPROM types supported are: 2758, 2716, 2732, 2732A, 2764, 2764A, 27128, 27128A, 27256, 2508, 2516, 2532 (single rail only). Fast intelligent programming algorithm is available for the 2764/27128/27256.

You can exit to BASIC (eg. to load/save programs) and then return to the menu.

SIDEWAYS ROM

£45.00



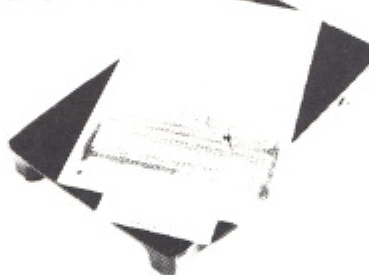
Holds machine code and BASIC programs in FOUR BANKS of EPROM. Eliminates the need for tape cassette or disks for special applications. Three of the banks hold up to 14K Bytes and the fourth holds 16K bytes and is compatible with existing DRAGON software cartridges.

Extra BASIC commands allow you to:

SELECT BANK, LOAD BASIC PROGRAM, RUN MACHINE CODE PROGRAM IN ROM, PREPARE A BASIC PROGRAM FOR BLOWING INTO EPROM (REQUIRES EPROM PROGRAMMER).

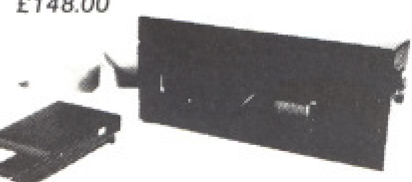
Accepts 2716, 2515, 2732, 2732A, 2532, 2764, 2764A, 27128, 27128A EPROMS (not tri-supply types). EPROMs not included.

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Includes examples and hints on how to use different types of cartridge in combination. For example: copying programs between DRAGON DOS and DELTA DOS, transferring a program from disk to EPROM Programmer for use in the SIDEWAYS ROM CARTRIDGE, loading a program from RS232 and saving to disk or EPROM.

Easy to use with Compusense FLEX. OS-9 users please enquire.

tin edge connector £7.00
gold edge connector £9.00

Pre-drilled, ready for soldering with convenient power and earth rails.

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How to submit articles

The quality of the material we can publish in *Dragon User* each month will, to a very great extent depend on the quality of the discoveries that you can make with your Dragon. The Dragon computer was launched on to the market with a powerful version of Basic, but with very poor documentation.

Articles which are submitted to *Dragon User* for publication should not be more than 3000 words long. All submissions should be typed. Please leave wide margins and a double space between each line. Programs should, whenever possible, be computer printed on plain white paper and be accompanied by a tape of the program.

We cannot guarantee to return every submitted article or program, so please keep a copy. If you want to have your program returned you must include a stamped, addressed envelope.

Contents



Editorial

THE OFFICIAL publication date for this magazine is November 20 — which means that you should all have read this before the 6809 Show. So you have no excuse not to go and support your machine.

If you are reading this at the 6809 Show, then you deserve praise for two reasons — firstly, having taken the trouble to show up and prove your loyalty to the Dragon, and secondly, because you've had the sense to buy *Dragon User.*

There will be a lot of other people at the show too.

Microdeal will be present in force, selling a vast number of games for the Dragon, including Mike Gerrard's new rave, *Trekboer:* Compusense will be taking up a large amount of space as well, selling amongst other things, the new 64K expansion board that can make your 64 a 128 (see Roy Coates review): Wintersoft will be selling *Juxtaposition,* another game Mike Gerrard fell over backwards about.

The list isn't endless, but there are plenty of other names as well: Cumana, Design Design, Trojan, CRL, Andtek, Blaby, and our very own Pam D'Arcy to name but a few.

And of course *Dragon User* will be there, and our roving reporters will be doing quite a lot of roving so they can write a proper show report for a future issue.

What's more, over 2,000 people, the organisers say, have already bought tickets, so it looks like it's going to be a record breaking turnout.

So just who isn't going to be there?

Well, it's unlikely that any representatives from the major high street retailers will be turning up.

Remember them? They're the people who decided the Dragon was dead, and nobody wanted to buy software and peripherals for it any more — or so they thought. They're the reason that you have to buy everything for your Dragon by post these days, unless you're lucky enough to live near one of the small independants who really know what there's a demand for.

Letters

This is the chance to air your views — send your tips, compliments and complaints to Letters Page, *Dragon User*, 12-13 Little Newport Street, London WC2H 7PP.

Powerless

COULD anyone at *Dragon User* tell me where I could purchase a transformer for my Dragon 32. I have tried Touchmaster, but they no longer stock it. Can the transformer be repaired or is it cheaper to buy new?

J Webb
44 Downland Place
Adastral Road
Canford Heath
Poole
Dorset BH17 7SN

Roll on!

I READ with interest your editorial in the October 85 issue which referred to the lack of effective marketing by some companies supporting the Dragon.

For myself I own a TRS-80 Co-Op 64, and I would like to see more companies providing compatible soft and hardware for both computers.

In the main it is the TRS-80 that is ignored — why is this?

There are over 100 Tandy branches in major towns, and cities in the U.K. alone. It must be an existing untapped market potential for most of these companies, and with the potential of an even bigger one.

I would also like to see *Dragon User* printing articles for the TRS-80, then I for one would be a regular purchaser of your magazine.

W. P. Flannery
140 Sevenoaks Road
Orpington
Kent BR6 9JZ

Pity the editor

PITY the poor Editor.

Make it simpler. Make it more complex. Make it all games. Don't give us any games — only utilities! It must be worse than being the Prime Minister or Leader of the Opposition!.

Whilst I sympathise with G R Guthrie (October issue), we all have to begin somewhere at sometime and I suspect it will not be very long before he might grumble that he could do with something better than kid's stuff (with respect to those kids who happen to be very advanced).

I hope he is carefully keeping all his copies of *Dragon User* for he will ultimately find them a most useful source of reference and ideas. I have every issue since No 1, but being very short of time can rarely try a program when first published. Also I am not into games at all nor do I have a disk system, so offerings of this nature are rather wasted on me. However, I am very happy that other readers' interests are being covered since this makes the magazine more of a viable proposition. It would have to be much more expensive to cover merely my interests alone!

I think *Dragon User* continues to improve — roll on the D'Arcys, Cadges, Whittakers et al, and dear Mr Editor please don't lower that standard but add a little encouragement for the Mr Guthries here and there.

Yes, people do type in long programs — I did Pam D'Arcy's Disassembler recently with much satisfaction.

B Yeoman Walker
Prescot
Merseyside

Jet Set Willy!

I HAVE been "wandering" through *Jet Set Willy's* mansion and have found 57 rooms/screens so far. Can anyone tell me how many there are supposed to be?

Plus, is there a cheat as in *Manic Miner?*

H. James
54 Albion Street
Castleton
Rochdale
Lancs

THE NEXT letter may be of some interest to you — so should the information following it . . .

Pokes!

THE following two programs will interest anyone who has purchased *Jet Set Willy* by Software Projects. Program A gives infinite lives and program B gives total immunity.

To use them type them in and enter EXEC171. Your *Jet Set Willy* original will then load and run as normal but without infinite lives or immunity.

If you are hoping to complete the game, there are some things to be careful of:

You need 99 objects to finish, no more and no less.

With infinite lives, endless loops can occur if you die at a monster's start position.

With immunity, endless loops can occur if you fall through killing blocks, ie the water in the bridge.

If you go to the top of the drain, an extra item is placed in the bathroom, so don't collect too many.

Program A

```
10 REM INFINITE LIVES.
EXEC 171 TO RUN
20 READM:POKE X+171,
M:X=X+1:IF X«15 THEN 20
30 DATA 16,206,0,255,189,
160,146,134,125,183,43,8,
126,9,9
```

Program B

```
10 REM IMMUNITY. EXEC
171 to RUN
20 READ M:POKE X+171,
M:X=X+1:IF X«22 THEN 20
30 DATA 16,206,0,255,189,
160,146,204,125,57,183,43,8,
183,43,11,247,43,20,126,9,9
```

Jet Set Willy
Afficionado

If the pokes don't work, then you could always try the codeword which allows you access to any screen so that you can practice the game. According to Wonderful Roy Coates (where would you be without him?) the procedure is as follows:

1. **Get the game running on any screen.**
2. **Press the M, A, and X keys at the same time**
3. **Using the left and right arrow keys, select your screen**
4. **Very quickly press the space bar and Miner Willy will appear in the middle of the screen**
5. **Using the four arrow keys, position Miner Willy where you want him on screen**
6. **Press the space bar and the game will start from that point**

Roy stresses that this works on all copies of the game: if it doesn't work for you, this isn't because you've got a different version of *Jet Set Willy*, you aren't doing it right.

Excellent

I HAVE been reading *Dragon User* since it was first published and find it an excellent magazine. Could I venture to make a suggestion (well two to be exact) which would further improve it?

Firstly I would find an index to topics covered in articles and the answers page most helpful. It would save me hours of searching for the little bit of information I need. Perhaps you could give consideration to this on, say, a yearly basis.

Secondly, would it be possible to publish a list of the useful POKEs which have appeared from time to time in various places. I am thinking of such things as the POKE for speeding up the operation of the computer and the one to obviate pressing <SHIFT+>O in order to get lowercase. Meanwhile, keep on publishing your excellent magazine.

John Appleyard
Leeds

Black screen

I HAVE had my Dragon 64 for eight months and although I have attempted some Basic programming, my knowledge of machine code is nil.

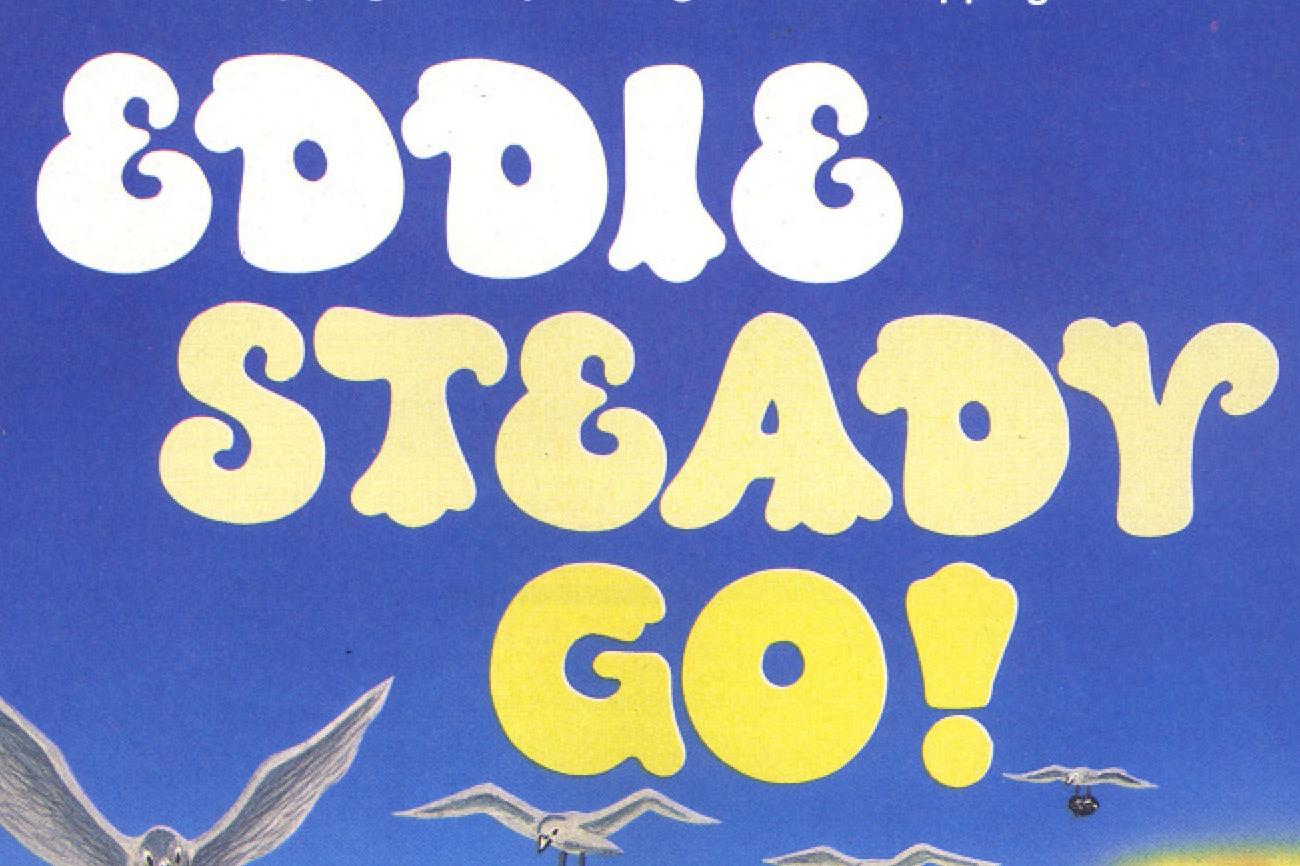
Regrettably, I purchased the Datacom games cassette before the review was published in the October edition of *Dragon User*. Jason Orbaum's views more or less sum up my own.

I have made a few minor changes, such as preventing the same word being selected repeatedly in *Execution*. However, as they all use a machine code loader, I have been unable to save these changes. Is there any way I can save these programs after amending them, and be able to load them again?

Also, can someone tell me if it is possible in Basic to change the standard text format to green on black as I am sure this would be better than black on green?

Alan Green
2 Rydal Close
Burlish Park
Stourport on Severn
Worcs

HERE IT IS ! The 22 screen, 60 level, See Sawing, Frog Slurping, Lift Catching, Apple Munching, Mind Blowing, Eddie Guiding, Arrow Dodging, Mountain Jumping, Laser Zapping, Airship Gazing, Boulder Hopping ......



PRIORITY ORDER FORM

Please rush me the titles as indicated below for my Dragon 32/64 computer.

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The Ket Trilogy of Adventures	£9.95	☐

I enclose cheque/P.O. for £............ or please debit my credit card no.

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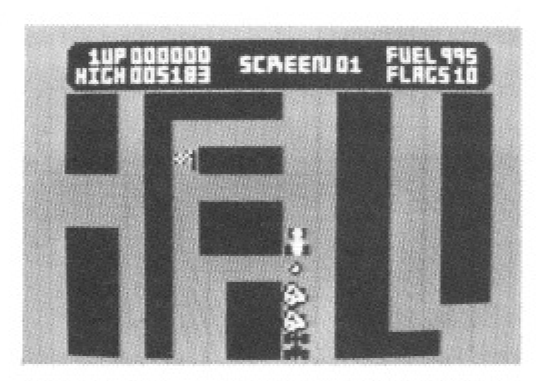
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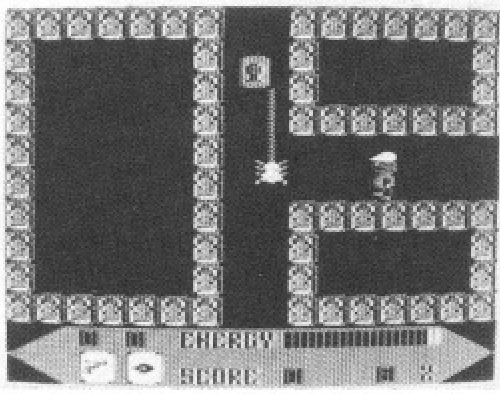
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NEW GAMES FROM BLABY COMPUTERS

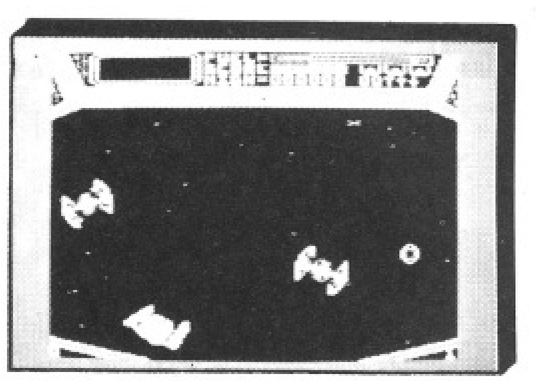
TANDY & DRAGON



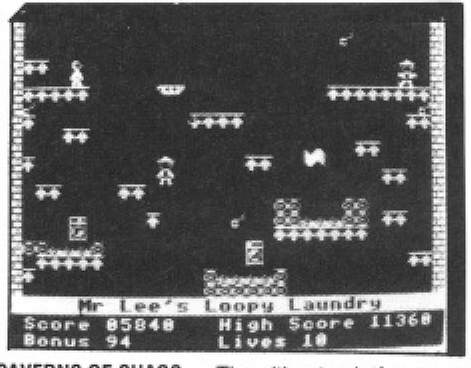
KAMACARZY — Guide your car around the maze avoiding boulders and Kamacarzy cars. KB/JS.
DRAGON £2.99



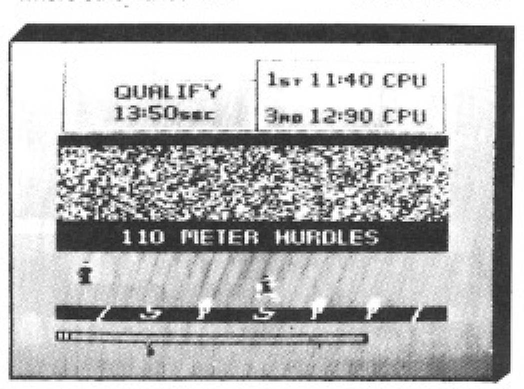
BROCKS KINGDOM — The powerful wizard rock has been banished by the king. He's left behind spells for would be successors. Can you succeed where other failed. KB. **DRAGON £1.99**



COSMIC CRUSADER — Venture where no man has dared to go before. View the galaxy from within the safety of your starship, but not for long — no less than 34 screens of inter-planetary alien life will challenge your reflexes and fire power. Superb sounds and graphics.
JS/KB **DRAGON £3.99 TANDY £3.99** TD



CAVERNS OF CHAOS — The ultimate platform game! If you've tried the rest, now try the best ever from Blaby. Words fail! We guarantee sheer delight. 20 screens.
KB/JS **DRAGON 32 £3.00** DT

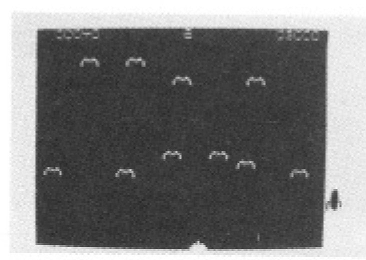


OLYMPIA — Compete in five athletic events — 100 metres, discus, long jump, hurdles and high jump. Features include high graphics sound, world records and hall of fame. KB
DRAGON £3.99
TANDY £3.99 DT

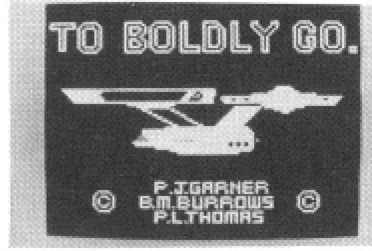
FINGERS

If you fancy yourself as a safe-cracker then read on. Thirteen screens of disappearing floors, conveyors and will you find out for yourself. Help light-fingered Fred to collect his golden keys to open each safe. JS

DRAGON 32 £3.99
TANDY EXT. £3.99 D

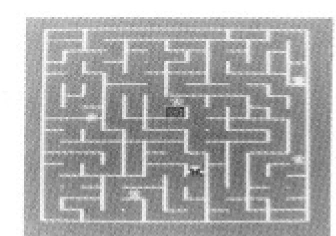


CREEPIES — The Creepies have re-volted — no longer will they stand for being stamped on, sprayed and poisoned. They will have their revenge! **Arcade-Action £3.99**

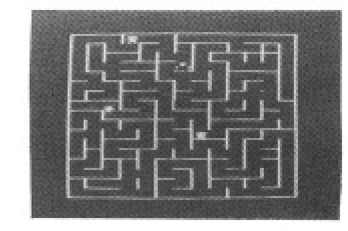


TO BOLDLY GO THE FINAL FRON-TIER — Kirk, Spock, McCoy, Scottie. Act out your own adventure with these star voyagers in the star ship Enter-prise. Up to four players. **Adventurer** D

BOTH GAMES £2.99



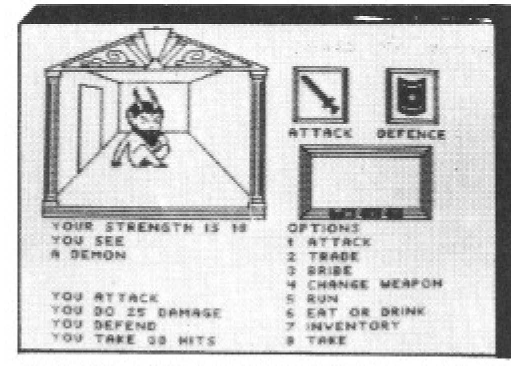
SEWER RATS — Get to the Sewer exit before the Demon infested sewers get you. Lay traps, beware of the Sewer gas. **Arcade-Action** D



RAIDERS — The Professor left on his quest for the lost Artifact a long time ago and has not returned — has he met with foul play? **Adventurer £3.99** D

BOTH GAMES £2.99

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AT THE 6809
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SWORD AND THE SORCERER — Our first graphic adventure. Journey back in time to the days of demons, vampires, werewolves and all. Fight to the death as they give no quarter. Keyboard uses single key entry.
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6809 Show

THE 6809 Show looks like being the best supported ever, if the organisers are right in their estimates.

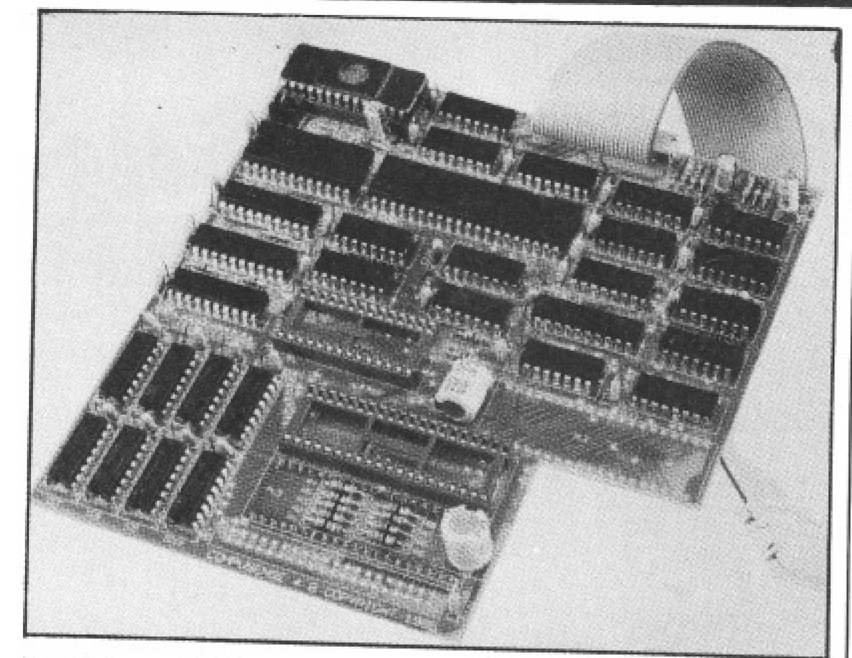
The list of companies attending is impressive — Microdeal, Tandy, Compusense, Cumana, Design Design, Datapen, Blaby, Peaksoft, Trojan, Greenweld, Smithson, John Penn, Micro Concepts, Andtek, Computape, Quickbeam, Incentive, Pamcomms, Cambridge Micro Processor, Modernsoft, Software Projects, Gamesmanship, Wintersoft, Harris Micros, Lucidata, Grosvenor, Modem House, Computer Bookshops, the 6809 User Group, the 68 Micro Group, and Dragon User. And that won't be all, by a long chalk.

Congratulations to all of them for supporting the Dragon.

Congratulations also to the 2,000 or so ordinary Dragon owners who have apparently already booked tickets, thus avoiding all that nasty queuing at the door.

There will be great numbers of new games and hardware on show, including Compusense's new Dragon expansion board that turns your Dragon 64 into a 128, and your 32 into a 96. Wintersoft will be showing *Juxtaposition:* Incentive will have *Eddy Steady Go!:* Microdeal will have hordes of new games, including *Trekboer* and *Module Man:* Lucidata will have the *Dragon's Claw,* a peripheral which gives your Dragon a BBC style interface:

If you aren't there you only have yourself to blame.



Microdeal roadshow

ALL IS not gloom for Microdeal lovers following the company's recent announcement that Microdeal, Pocket Money, Bad Taste, Spectral, Micromania and Salamander products would only be available by mail order from the Cornish company's Micropost division.

John Symes, Microdeal's managing director, has copied Radio One and organised a Microdeal Roadshow to bring his products to the public.

The Roadshow will be covering the length and breadth of England and (a bit of) Wales.

On November 2 and 3, it will be at UMIST in Sackville Street, Manchester: On November 5 and 6, at the Civic Centre Exhibition Hall, Newcastle Upon Tyne: on November 7, the Wellesly Hotel, Wellington Street, Leeds: on November 8, Room G63, Aston University, Birmingham: on November 9 and 10, Sloans Hotel, Westgate Street, Cardiff.

Admission to the Show is free, and there will be lots of games, many of them at bargain prices.

And don't forget that Microdeal will also be at the 6809 Show, November 23 and 24, Royal Horticultural Halls, London. You'll have to buy tickets for that, though.

Memo to Microdeal: what about the Scots and the Irish?

Microdeal is at 41 Truro Road, St Austell, Cornwall PL25 5JE.

DRS Rom

GROSVENOR Software has produced a Rom cartridge version of its database utility *DRS,* extending the size of database supported to 28,000 bytes, compared to 22,000 for the cassette version.

DRS was written by Mike Kerry, who also wrote Grosvenor's *Alldream* assembler system.

Apparently, there are some very powerful features included — search, update and sort facilities amongst them.

DRS costs £18.40 on cartridge, and £10.35 on cassette, transferable to disk.

Grosvenor Software is at 2 Beacon Close, Seaford, East Sussex BN25 2JZ.

Meaning business

HARRIS Software is about to launch three new programs for Dragondos or Cumana Dos users. The three titles are a continuation of Harris' series of programs for home and small business use.

The first title is *Stockbox,* a stock control system which can record sales, customers orders, deliveries and supplier orders.

It can report on low stock, orders outstanding, stock valuation at cost or selling price, turnover and profit margins and a host of other things.

Orderbox* is an invoicing program which prints invoices onto either plain or pre-printed paper. It can be linked to *Salesbox,* Harris' sales ledger program, or to *Stockbox.

***Sharebox* is a share management program, which can be used to record the details of a portfolio of stocks and shares, and print or display valuations, capital gains, dividends and tax credits, and so on. It can also draw graphs of price trends.**

***Stockbox* costs £19.99, *Orderbox* and *Sharebox* £16.99.**

Harris will be exhibiting for the first time ever at the Third 6809 Show, and will have all their software on display.

Otherwise, Harris Micro Software can be contacted at 49 Alexandria Road, Hounslow, Middlesex TW3 4HP.

Pamcomms plain

ONE OF *Dragon User*'s best contributors, Pam D'Arcy — wizard of the keyboards — has finally decided to make some money out of her programming skills.

She has formed her own company — Pamcomms — dedicated to supplying low priced, high quality software for the Dragon.

The first fruits of her labours, Pamcomms Plain Packs, will be on view at the 6809 Show.

Diskpix is a PMODE3/4 graphics pixel editor for full screen or individual sprite character/sprite editing. Supplied on cassette with sample character sets, simple Basic demonstrating programs and supporting documentation, it costs just £3.00.

Also on sale at the 6809 Show from Pam will be an *Electronic Book Starter Pack* at £1.50, and *Golden Oldies,* featuring an enhanced version of *Disk Detective* and a selection of other past magazine contributions, at £3.00.

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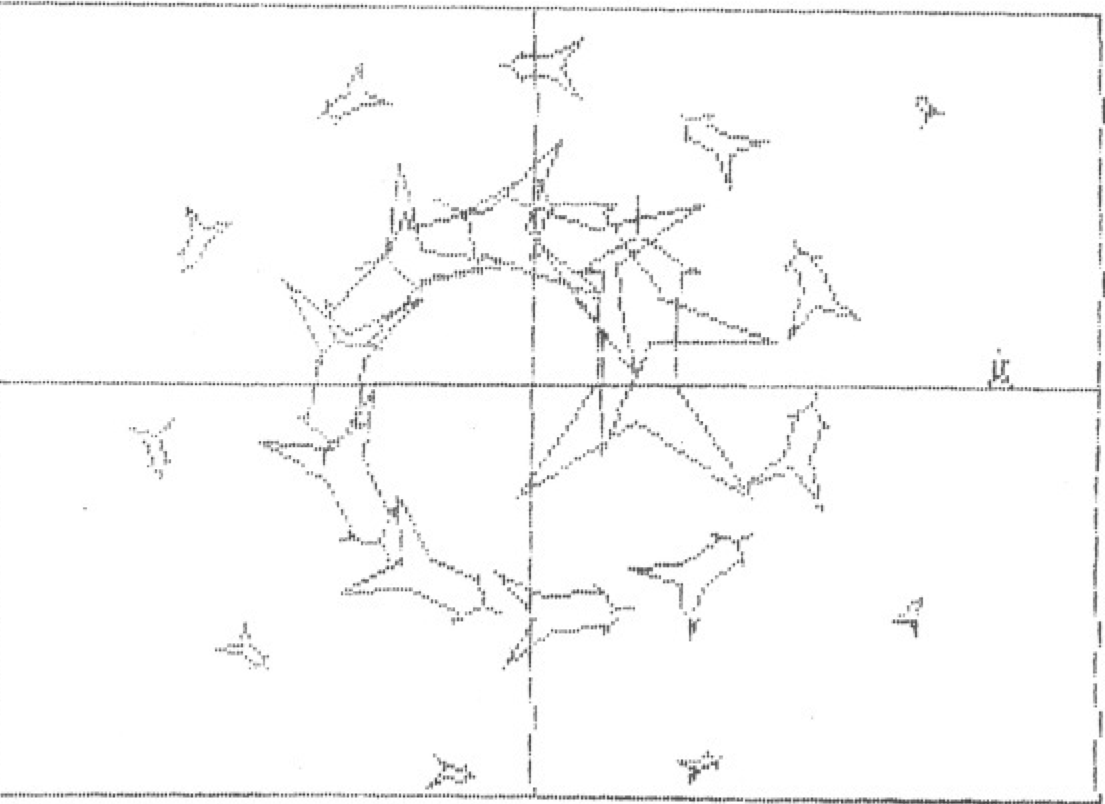
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The Dragon draws in two dimensions

__Peter Whittaker__ demonstrates how to get the best out of a flat surface

THE DRAGON'S DRAW command is very powerful, but it does have its limitations. It is no great task to DRAW a square, and it is easy to move the square around the screen, but once complicated rotations are required, the DRAW command starts to show its limitations since objects can only be rotated in ninety degree steps. There are similar limitations with the scaling ability of the DRAW command, and so, it would not, for example, be an easy task to draw a spaceship spiralling away from a planet, and getting smaller as it went (Fig #1). To accurately move objects around in two-dimensional space, we must abandon the DRAW command in favour of a co-ordinate based system. These co-ordinates can be manipulated, and then joined together using the LINE command. This way we will be able to improve on the scaling and rotation of the DRAW command, and also add shearing and reflection to our repertoire.



The equations used to manipulate the co-ordinates are recorded in the form of matrices. This facilitates the combination of several operations into one equation. Table #1, using an anti-clockwise rotation as an example, shows how an object's co-ordinate system is multiplied with a matrix to give the object's new position. The result of this matrix manipulation is used in Listing #1 (lines 60 and 70) to draw a rotating space ship. (Delete the REM statement in line 80 before RUNning.) The origin has been moved to the centre of the screen. For a smoother rotation, change the STEP value in line 130. Table #2 gives a list of all the matrices we will need for object manipulation in two dimensions.

$$(Xt,Yt) = (X,Y,1) \times \begin{pmatrix} A & D & G \\ B & E & H \\ C & F & I \end{pmatrix} = \begin{pmatrix} XA & XD & XG \\ +YB & +YE & +YH \\ +\underline{1C} & +\underline{1F} & +\underline{1I} \end{pmatrix}$$

X co-ord, Y co-ord, 1

$$(Xt,Yt) = (XA+YB+C,\ XD+YE+F,\ XG+YH+I) \quad (G \text{ and } H = 0)$$

$$(Xt,Yt) = (XA+YB+C,\ XD+YE+F)$$

$$(Xr,Yr) = (X,Y,1) \times \begin{pmatrix} \cos\theta & \sin\theta & 0 \\ -\sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{pmatrix}$$

$$= (X\cos\theta - Y\sin\theta + 0,\ X\sin\theta + Y\cos\theta + 0,\ 0X + 0Y + 1)$$

$$(Xr,Yr) = (X\cos\theta - Y\sin\theta,\ X\sin\theta + Y\cos\theta)$$

Table 1. Object manipulation by matrix multiplication.

All of the matrices in Table #2 are for operations based around the origin (co-ordinates 0,0). If we try to use them to rotate an object that is not centred on the origin, the object may not move in the way we would like. Change line 80 for DATA 40,40,60,40,60,60,40,60,40,40 and RUN the program again. Instead of spinning about its centre, the square will orbit the centre of the screen. If we want the square to rotate about its own centre, we must first move it to the origin, then rotate it, and then move it back.

This would take three sets of matrix multiplications to do. However, the process can be much speeded up by first combining the matrices into one compound matrix. Table #3 shows how two matrices can be combined, and Table #4 works out the combined matrix for our square rotation program. EDIT lines 60 and 70 to DEF FNA(X)=(X−50)*COS(THETA)+(Y−50)*SIN(THETA)+50 DEF FNB(Y)=(Y−50)*COS(THETA)−(X−50)*SIN(THETA)+50 and RUN the program again. Now the square rotates about its

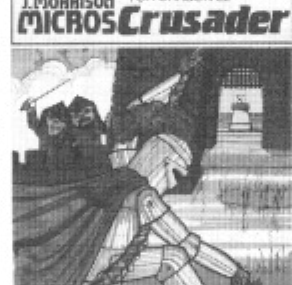
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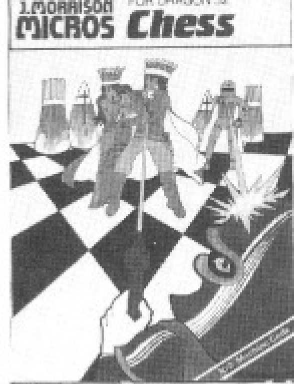
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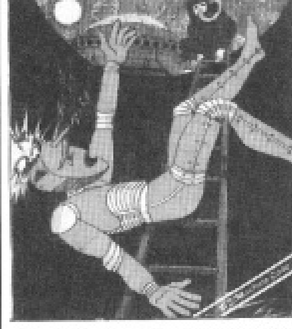
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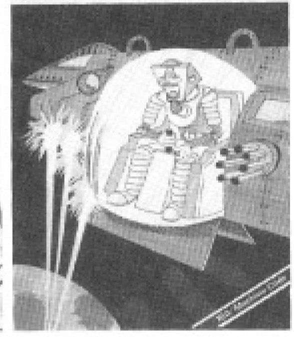
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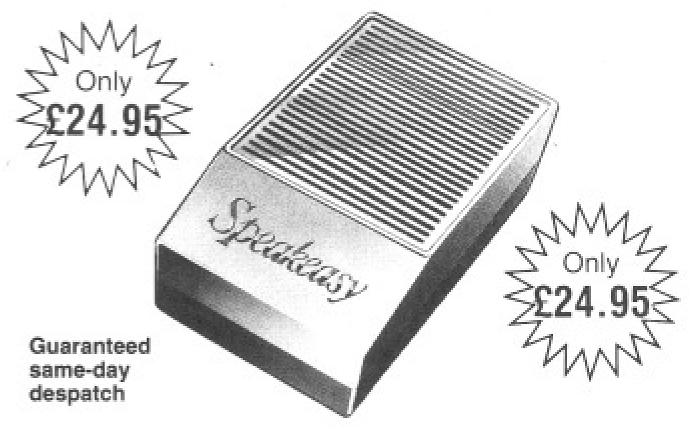


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$$\begin{pmatrix}1 & 0 & 0\\0 & 1 & 0\\0 & 0 & 1\end{pmatrix}$$
Identity

$$\begin{pmatrix}\cos\theta & -\sin\theta & 0\\\sin\theta & \cos\theta & 0\\0 & 0 & 1\end{pmatrix}$$
Rotation clockwise

$$\begin{pmatrix}-1 & 0 & 0\\0 & 1 & 0\\0 & 0 & 1\end{pmatrix}$$
Reflection Yaxis

$$\begin{pmatrix}S1 & 0 & 0\\0 & S2 & 0\\0 & 0 & 1\end{pmatrix}$$
Scaling

$$\begin{pmatrix}\cos\theta & \sin\theta & 0\\-\sin\theta & \cos\theta & 0\\0 & 0 & 1\end{pmatrix}$$
Rotation anticlockwise

$$\begin{pmatrix}1 & 0 & 0\\0 & -1 & 0\\0 & 0 & 1\end{pmatrix}$$
Reflection Xaxis

$$\begin{pmatrix}1 & 0 & 0\\S & 1 & 0\\0 & 0 & 1\end{pmatrix}$$
Shear X

$$\begin{pmatrix}1 & S & 0\\0 & 1 & 0\\0 & 0 & 1\end{pmatrix}$$
Shear Y

$$\begin{pmatrix}1 & 0 & 0\\0 & 1 & 0\\TX & TY & 1\end{pmatrix}$$
Translation X,Y

Table 2. Matrices for origin centred object manipulation.

$$\begin{pmatrix}a & d & g\\b & e & h\\c & f & i\end{pmatrix} \times \begin{pmatrix}A & D & G\\B & E & H\\C & F & I\end{pmatrix}$$
Matrix 1 Matrix 2

Multiply each row in matrix 1 by each column in matrix 2.

Top line = $\begin{pmatrix}aA & aD & aG\\dB & dE & dH\\gC & gF & gI\end{pmatrix}$ total

Centre line = $\begin{pmatrix}bA & bD & bG\\eB & eE & eH\\hC & hF & hI\end{pmatrix}$ total

Bottom line = $\begin{pmatrix}cA & cD & cG\\fB & fE & fH\\iC & iF & iI\end{pmatrix}$ total

$$\begin{pmatrix}aA+dB+gC & aD+dE+gF & aG+dH+gI\\bA+eB+hC & bD+eE+hF & bG+eH+hI\\cA+fB+iC & cD+fE+iF & cG+fH+iI\end{pmatrix}$$

Table 3. How to multiply two matrices to get one compound matrix

$$\underset{\text{Translation}}{\begin{pmatrix}1 & 0 & 0\\0 & 1 & 0\\TX & TY & 1\end{pmatrix}} \times \underset{\text{Rotation}}{\begin{pmatrix}\cos\theta & -\sin\theta & 0\\\sin\theta & \cos\theta & 0\\0 & 0 & 1\end{pmatrix}} \times \underset{\text{Translation}}{\begin{pmatrix}1 & 0 & 0\\0 & 1 & 0\\-TX & -TY & 1\end{pmatrix}}$$

$$= \begin{pmatrix}\cos\theta & -\sin\theta & 0\\\sin\theta & \cos\theta & 0\\(TX\cos\theta+TY\sin\theta-TX) & (-TX\sin\theta+TY\cos\theta) & 1\end{pmatrix} \times \begin{pmatrix}1 & 0 & 0\\0 & 1 & 0\\-TX & -TY & 1\end{pmatrix}$$

$$\begin{pmatrix}\cos\theta & -\sin\theta & 0\\\sin\theta & \cos\theta & 0\\(TX\cos\theta+TY\sin\theta-TX) & (-TX\sin\theta+TY\cos\theta-TY) & 1\end{pmatrix}$$

Table 4. Matrix combination.
Translation to origin x rotation x translation back.

own centre, and does not orbit the origin. The same process of matrix combination can be carried out to include scaling, shearing, reflection, and variable translation. Restore the original rocket co-ordinates to line 80, and EDIT lines 60 and 70 to DEF FNA(X)=X*S *COS(THETA) +TX*COS(THETA)=TY* SIN(THETA) =Y*S*SIN(THETA) and DEF FNB(Y) =X*S*SIN(THETA)+Y*S*COS (THETA) +TX*SIN(THETA)+TY*COS (THETA)). Add lines 125 TX=20:TY=Ø:S=1 and 135 S=S*.9:TX=TX+3 where S=the scale, TX=the translation along the Xaxis, and TY=the translation along the Yaxis. Now RUN the program and you will see the spaceship spiral out from the centre of the screen, getting smaller each time it moves, until it eventually disappears from the screen. (Fig #1).

Slow

The program works well, but it is quite slow. It can be speeded up by reducing the amount of number crunching carried out. Instead of reading the co-ordinates from data statements each time, we can read them from an array. Secondly, if we update the co-ordinates each time we move the object, we do not need to keep on recalculating the matrix values every time. Instead we can use the same matrix each time on our updated co-ordinate system. Listing #2 demonstrates the increase in speed of operation using this approach, running at about twice the speed of listing #1. To help with this, listing #3, when RUN will calculate the resulting matrix when two matrices are entered for multiplication. The result matrix can be used in the DEF FNA/B statements to modify the movement of an object.

Fast

This is about as fast as we will get with 'real time' two dimensional graphics, without resorting to machine-code. Unfortunately, this is still not good enough for use in animation sequences. If we want faster graphics, we must resort to 'off line' animation (Listing #4). This technique involves splitting the program into two halves, and running them separately. The first half does all the number crunching. It calculates the spaceship co-ordinates as it spirals around the planet, but instead of drawing in the spaceship, the data is saved to high memory. The second half of the program then does all of the drawing. The data has been poked into high memory, and so all that needs to be done is to peek the data and draw to the co-ordinates indicated.

When RUN, select option #1, and the program will take several minutes to calculate the data. Eventually it will crash when the spaceship leaves the confines of the screen, and the program tries to poke a number greater than 255 or smaller than 0 into memory. Run the program again, and select option #4. This will draw in the spaceship as it spirals around the screen. The increase in speed is quite dramatic, with hardly a pause between each movement of the ship. The data can be saved to tape by selecting option #2, and reloaded by option #3. This saves the long wait of the data calculation section of the prgram. The program can be easily modified to manipulate different shapes (change the DATA line) through different movements (change the DEF FNA/B lines). Try it and see.

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LISTING #1. SPACESHIP SPIN

```
0 POKE65495,0:'HIGH SPEED POKE
10 '*****INITIALISE******
20 PCLEAR8
30 RESTORE:NUM=0
40 READ A:IF A<>999 THEN NUM=NUM+1:GOTO40
50 NUM=NUM/2-1:'COUNT HOW MANY SETS OF CO-ORDINATES
60 DEF FNA(X)=X*COS(THETA)-Y*SIN(THETA):'X ROTATION
70 DEF FNB(Y)=Y*COS(THETA)+X*SIN(THETA):'Y ROTATION
80 DATA 0,40,15,30,10,30,10,0,30,-30,0,-10,-30,-30,-10,0,-10,30,-15,30,0,40,0,50:'CO-ORDINATE DATA FOR SPACESHIP
90 DATA 999
100 '********DEMO********
110 PMODE4,1:PCLS:SCREEN1,0:'DISPLAY SCREEN
120 LINE(125,0)-(125,191),PSET:LINE(0,91)-(255,91),PSET:'DRAW X$Y AXIS
130 FOR THETA=0 TO 6.5 STEP .1:'ROTATION
140 GOSUB170:NEXT THETA
150 STOP
160 '******DRAW******
170 PMODE4,5:PCLS:'DRAWING SCREEN
180 LINE(0,91)-(255,91),PSET
190 LINE(125,0)-(125,191),PSET
200 RESTORE:READ X,Y:'READ CO-ORDINATES
210 LINE(FNA(X)+125,91-FNB(Y))-(FNA(X)+125,91-FNB(Y)),PSET:'SET LINE TO START CO-ORDINATE
220 FOR A=1 TO NUM
230 READ X,Y
240 LINE-(FNA(X)+125,91-FNB(Y)),PSET:'DRAW IN OBJECT
250 NEXT A
260 FOR A=1 TO 4:PCOPY A+4 TO A:NEXT:'COPY TO DISPLAY SCREEN
270 RETURN
280 '(C) 1985 PETER WHITTAKER
```

LISTING #2. SPACESHIP SPIRAL

```
0 POKE65495,0
10 PCLEAR8:PMODE4,1:PCLS:SCREEN1,0:PMODE4,5:PCLS
20 RESTORE
30 READ A:IF A<>999 THEN NUM=NUM+1:GOTO30
40 NUM=NUM/2-1
50 DIMX(NUM),Y(NUM)
60 RESTORE
70 FOR A=0 TO NUM
80 READ X(A),Y(A):'READ CO-ORDINATES INTO ARRAY
90 NEXT A
100 DATA 10,0,10,40,25,30,20,30,20,0,40,-30,10,-10,-20,-30,0,0,0,30,-5,30,10,40,10,50
110 DATA 999
115 S=.95:SS=SIN(.3):CC=COS(.3):'SCALE/SIN(THETA)/COS(THETA)
120 '*****DRAW ROUTINE*****
130 PCLS:LINE(0,91)-(255,91),PSET:LINE(125,0)-(125,191),PSET
140 X1=-X(0):Y1=-Y(0):X2=X(0)*1.05:Y2=Y(0)*1.05:'TRANSLATION TO/FROM ORIGIN
150 FOR A=0 TO NUM
160 A1=X(A)*S*CC-Y(A)*S*SS+(S*X1+X2)*CC-(S*Y1+Y2)*SS
170 A2=X(A)*S*SS+Y(A)*S*CC+(S*X1+X2)*SS+(S*Y1+Y2)*CC
180 X(A)=A1:Y(A)=A2:NEXT A:'CO-ORDINATE UPDATE
190 LINE(X(1)+125,91-Y(1))-(X(1)+125,91-Y(1)),PSET:'SET LINE TO OBJECT START POINT
200 FOR A=2 TO NUM
210 LINE-(X(A)+125,91-Y(A)),PSET:'DRAW LINES
220 NEXT A
230 FOR A=1 TO 4:PCOPY A+4 TO A:NEXT A:'COPY TO DISPLAY SCREEN
240 GOTO130
250 '(C) 1985 PETER WHITTAKER
```

LISTING #3. MATRIX MULTIPLY

```
10 CLS:PRINT"A D G     a d g"
20 PRINT"B E H  *  b e h"
30 PRINT"C F I     c f i"
40 PRINT"MATRIX 1....."
50 FOR A=1 TO 9
60 PRINTCHR$(64+A);"..";:INPUTA(A)
70 NEXT A
80 PRINT"MATRIX 2....."
90 FOR A=1 TO 9
100 PRINTCHR$(96+A);"..";:INPUTB(A)
110 NEXT A
120 CLS:PRINT@8,"SOLUTION":PRINT
```



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```
130 PRINTA(1)*B(1)+A(4)*B(2)+A(7)*B(3);
140 PRINTTAB(10)A(1)*B(4)+A(4)*B(5)+A(7)*B(6);
150 PRINTTAB(20)A(1)*B(7)+A(2)*B(8)+A(3)*B(9)
160 PRINTA(2)*B(1)+A(5)*B(2)+A(8)*B(3);
170 PRINTTAB(10)A(2)*B(4)+A(5)*B(5)+A(8)*B(6);
180 PRINTTAB(20)A(2)*B(7)+A(5)*B(8)+A(8)*B(9)
190 PRINTA(3)*B(1)+A(6)*B(2)+A(9)*B(3);
200 PRINTTAB(10)A(3)*B(4)+A(6)*B(5)+A(9)*B(6);
210 PRINTTAB(20)A(3)*B(7)+A(6)*B(8)+A(9)*B(9)
220 '(C) 1985 PETER WHITTAKER
```

LISTING #4.
OFFLINE SPIRAL

```
10 CLEAR200,20000:'PROTECT MEMORY FOR OBJECT DATA
20 POKE65495,0
30 '*****INITIALISE******
40 PCLEAR8
50 RESTORE:NUM=0
60 READ A:IF A<>999 THEN NUM=NUM+1:GOTO60
70 NUM=NUM/2-1:'NUMBER OF CO-ORDINATES
80 CLS:PRINT@11,"SPACESHIP":PRINT:PRINT"SELECT CHOICE:-":PRINT"1...CALCULATE DATA":PRINT"2...SAVE DATA":PRINT"3...LOAD DATA":PRINT"4...RUN DATA"
90 INPUT A:ON A GOTO 120,390,400,2880
100 GOTO 80
110 '******CALCULATE DATA******
120 DEF FNA(X)=X*S*COS(THETA)+TX*COS(THETA)-TY*SIN(THETA)-Y*S*SIN(THETA)+125
130 DEF FNB(Y)=-(X*S*SIN(THETA)+Y*S*COS(THETA)+TX*SIN(THETA)+TY*COS(THETA))+91
140 TX=20:TY=-10:S=1:'TRANSLATION ALONG X&Y AXIS AND SCALE
150 DATA 0,40,15,30,10,30,10,0,30,-30,0,-10,-30,-30,-10,0,-10,30,-15,30,0,40,0,50
160 DATA 999
170 BYTE=20000:'PROTECTED MEMORY
180 FOR THETA=0 TO 50 STEP .1:'ROTATION STEP
190 S=S*.99:TX=TX+.3:'SHRINK RATE & SPIRAL RATE
200 RESTORE
210 FOR A=0 TO NUM
220 READ X,Y
230 POKE BYTE,FNA(X):POKE BYTE+1,FNB(Y):BYTE=BYTE+2:'SAVE UPDATED CO-ORDINATES
240 PRINTBYTE
250 NEXT A,THETA
260 GOTO80
270 '*****DRAW DATA*****
280 BYTE=20000
290 PMODE4,1:SCREEN1,0
300 PMODE4,5:PCLS
310 LINE(0,91)-(255,91),PSET:LINE(125,0)-(125,191),PSET
3220 LINE(PEEK(BYTE),PEEK(BYTE+1))-(PEEK(BYTE),PEEK(BYTE+1)),PSET
330 BYTE=BYTE+2
340 FOR A=1 TO NUM
350 LINE-(PEEK(BYTE),PEEK(BYTE+1)),PSET:BYTE=BYTE+2:NEXT A
360 FOR A=1 TO 4:PCOPY A+4 TO A:NEXT
370 GOTO 300:'LOOP
380 STOP
390 CSAVEM"DATADATA",20000,32000,0:GOTO80
400 CLOADM"DATADATA":GOTO80
410 '(C) 1985 PETER WHITTAKER
```

Machine code made simple

***Ray Collinson** with some simple machine code routines*

HAVING WRITTEN a machine code routine for the 32X16 screen, I also wanted to include some text, PRINTing or POKEing from BASIC being undesirable in this case. The psuedo-op FCC-FORM CONSTANT CHARACTER was the obvious instruction to use, but the problem was in retrieving the characters stored in memory and PRINTing them to the screen. The immediate requirement seemed to be to set a pointer to a memory location, store the operand in a register then send it to the screen.

The ACCUMULATOR-OFFSET INDEXED instruction seemed most appropriate in pointing to and retrieving from memory any characters stored there by the FCC instruction. Using both accumulators, it is written #LDA B,Y#. This means take the current value held in the B register, add it to the address held in the Y register, and store the operand to the A accumulator ready to PRINT on the screen.

Enter listing #1 and, when assembled, CSAVE a copy before EXECuting. If you are uncertain about the function of lines 190 and 280, delete or REM each line, re-assemble and EXECute.

If you have studied any physics you may remember reading about Crooke's Dark Spaces. What you should have is the Dragon's dark spaces. We are in effect POKEing data to memory and, since there is no CHR$ equivalent to POKE (see *Introducing Dragon Machine Code* Pp 66-67, by Ian Sinclair), the Dragon gives an inverted space. This means that we need to change the data stored in the A register.

You understand, of course, that numbers are stored and used in binary form. For a space, we have in the A register Hex 20-denary 32, or in binary 00100000; the number that the DRAGON requires is denary 96 or in binary 01100000, which is the POKE equivalent of CHR$ 32. The INCLUSIVE OR operation returns a 1 if either one of the operands is a 1. So, if we logically OR 64 and 32 together . . .

```
         00100000 32
        +01000000 64
We get   01100000 96
```

In other words, set bit 6 in the A accumulator ready to store in video memory.

The comments in listing #1 should adequately explain the remainder of the program.

Listing #2 shows a slightly different method in lines 105 onwards. Line 105. .LEAX-LOAD EFFECTIVE ADDRESS X adds 43 to the X register and sets up the video memory address where the next line of text is to be displayed. Line 130 finds the first character, in this case a space; the data in the Y register is LOADed into the A accumulator and the Y register is then incremented. This is rather a tortuous method but demonstrates how registers can be manipulated.

Listing #3 inverts the first text line so it is not necessary to carry out any operations on the spaces. However to invert the text we need to reset bit 6. To see why this is so, type into listing #1 FCC "A LINE OF TEXT" in SHIFT 0 inverted characters.

To reset bit 6 we need to carry out an EXCLUSIVE OR operation on the A register. The EOR returns a 1 if one and only one of the operands is a 1. Now the ASCII code for A is denary 65 (in binary 01000000) and for A inverted, which is what we want, it is 00000001, so if we EROA, which contains 65 with 64, ie reset bit 6, as in:

```
         01000001 65
         01000000 64
We get   00000001 01
```

and we get an inverted character.

The remainder of the program follows the same structure as the previous listings.

Listing #4 was originally a subroutine and so the register values had to be preserved, but on its own the PSHS and PULS instructions can be left out.

The first text line is inverted by the program but by calling the routine held in ROM at address $B54A you can enter text in SHIFT 0 mode. This is an implemented PRINT routine. If you use the SHIFT 0 mode the spaces between words will be unchanged, so a modification to the prog-

LISTING #1

```
10 '****************************
12 '*TEXT IN M/C CODE PROGRAMS *
14 '*  USING PSUEDO-OP 'FCC'   *
24 '****************************
26 '*   LISTING 1 AND 4 ONLY   *
28 '*     FULLY COMMENTED      *
30 '****************************
100 CLEAR100,&H7FA0
110 EXEC &HCFFA
120 ALL:FML
140 @START EQU *
7FA1                    145     PRT
7FA1 5F                 150     CLRB
7FA2                    155 *  SET THE PRINT POSITION
7FA2 8E04A8             160     LDX #1192
7FA5                    165 *  GET FIRST CHARACTER
7FA5 108E7FCB           170     LDY #@TXT
7FA9                    175 * MOVE IT TO THE:'A'REGISTER
7FA9 A6A5               180 @NXT LDA B,Y
7FAB                    185 *  AND  RESET BIT 6
7FAB 8A40               190     ORA #64
7FAD                    195 * STORE IT AT SCREEN ADDRESS
7FAD A780               200     STA ,X+
7FAF                    205 * ADD 1 TO COUNTER
7FAF 5C                 210     INCB
7FB0                    215 * FOUND LAST CHARACTER
7FB0 C110               220     CMPB #16
7FB2                    225 * YES!START NEW LINE
7FB2 2702               230     BEQ @NXTLN
7FB4                    235 * NO!GO FOR NEXT CHARACTER
7FB4 20F3               240     BRA @NXT
7FB6                    245 * ZERO COUNTER,SET SCREEN
7FB6                    246 * FOR NEW LINE OF TEXT
7FB6 5F                 250 @NXTLN CLRB
7FB7 30882B             250     LEAX +43,X
7FBA                    255 * FIND FIRST CHARACTER
7FBA 108E7FDB           260     LDY #@TXT1
7FBE                    265 * MOVE TO ACCUMALATOR
7FBE A6A5               270 @NCHR LDA B,Y
7FC0                    275 * RESET BIT 6
7FC0 8A40               280     ORA #64
7FC2                    285 * STORE AT SCREEN ADDRESS
7FC2 A780               290     STA ,X+
7FC4                    295 * ADD 1 TO COUNTER
7FC4 5C                 300     INCB
7FC5                    305 * CHECK FOR LAST CHARACTER
7FC5 C11B               310     CMPB #27
7FC7                    315 * RETURN TO BASIC :ELSE GO
7FC7                    316 * FOR NEXT CHARACTER
7FC7 272D               320     BEQ @OUT
7FC9 20F3               320     BRA @NCHR
7FCB 2041204C494E4520   330 @TXT FCC " A LINE OF TEXT "
7FDB 20464F52204D4143   340 @TXT1 FCC " FOR MACHINE CODE PROGRAMS "
7FF6 39                 350 @OUT RTS
7FF7                    350     END @START
```

LISTING #2

```
10 CLEAR100,&H7FA0
20 EXEC &HCFFA
30 ALL:FML
40 @START EQU *
50 ****************************
60 *  BEGIN AS IN LISTING 1    *
70 ****************************

7FA1                     75     PRT
7FA1                     79 *CLS IN ROM
7FA1 BDBA77              80     JSR $BA77
7FA4 5F                  80     CLRB
7FA5 8E04A8              90     LDX #1192
7FA8 108E7FCD           100     LDY #@TXT
7FAC A6A5               110 @NXT LDA B,Y
7FAE 8A40               120     ORA #64
7FB0 A780               130     STA ,X+
7FB2 5C                 140     INCB
7FB3 C110               150     CMPB #16
7FB5 2702               160     BEQ @NXTLN
7FB7 20F3               170     'BRA @NXT
7FB9 5F                 180 @NXTLN CLRB
7FBA 30882B             180     LEAX +43,X
7FBD                    190 +##############################+
7FBD                    200 *GO BY THE SCENIC ROUTE TO *
7FBD                    210 *     GET:'Y' INTO 'A'        *
7FBD                    220 *##############################*
7FBD 31A810             230     LEAY +16,Y
7FC0 A6A0               240 @NCHR LDA ,Y+
7FC2 8A40               250     ORA #64
7FC4 A780               260     STA ,X+
7FC6 5C                 270     INCB
7FC7 C11B               280     CMPB #27
7FC9 272D               290     BEQ @OUT
7FCB 20F3               290     BRA @NCHR
7FCD 2041204C494E4520   300 @TXT FCC " A LINE OF TEXT "
7FDD 20464F52204D4143   310     FCC " FOR MACHINE CODE PROGRAMS "
7FF8 39                 320 @OUT RTS
7FF9                    320     END @START
330 EXEC
340 SCREEN0,1
350 GOTO350
```

ram will be required if this is not desirable.

In this program, to invert the text we logically OR the A register with 32 and to put in a black space we OR the accumulator with 128. The PRINT routine at $B54A requires that the ASCII codes are stored in the A register only. In order to put the text at a specific screen position, it is necessary to use the cursor address at locations $88-$89.LOAD the X register with the required screen address then STX $88; the 16 bit address is then stored in both locations.

Before returning to BASIC, you will have to re-locate the cursor position at some appropriate place on the screen. For example, if you want to return the cursor to the home position, then $400,LDX #$400. . .STX $88, puts it in the top left hand corner of the screen.

Those readers not possessing an assembler should input the Hexadecimal numbers in the OBJECT code and write a READ/DATA program to store the m/c code in memory.

This program is not written in an ideal format, since you will notice that there are repeated instructions which are untidy and waste memory; the object, though, is to familiarise beginners with the ways in which the registers and memory can be handled.

Listing #5 uses a ROM routine to PRINT to the screen and the address is repeatedly called as a sub-routine, which makes it compact, fast and tidy.

LISTING #3

```
****************************
*NOW USE INVERSE CHARACTERS
* FOR THE FIRST  TEXT LINE
****************************
7FA1                 136       PRT
7FA1 5F              140       CLRB
7FA2 8E04A8          145       LDX #1192
7FA5 108E7FCF        150       LDY #@TXT
7FA9 A6A5            155 @NXT LDA B,Y
7FAB                 160 **CHECK FOR LEADING SPACE***
7FAB 8120            165       CMPA #32
7FAD 2702            165       BEQ @PRT
7FAF                 170 *NO SPACE FOUND,INVERT THE *
7FAF                 175 ****      CHARACTER       ****
7FAF 8840            180       EORA #64
7FB1 A780            185 @PRT STA ,X+
7FB3 5C              190       INCB
7FB4 C110            195       CMPB #16
7FB6 2702            200       BEQ @NXTLN
7FB8 20EF            205       BRA @NXT
7FBA 5F                        210 @NXTLN CLRB
7FBB 308830                    210       LEAX +48,X
7FBE 108E7FDF                  215       LDY #@TXT1
7FC2 A6A5                      220 @NCHR LDA B,Y
7FC4 8A40                      225       ORA #64
7FC6 A780                      230       STA ,X+
7FC8 5C                        235       INCB
7FC9 C110                      240       CMPB #16
7FCB 2722                      245       BEQ @OUT
7FCD 20F3                      245       BRA @NCHR
7FCF 2041204C494E4520          250 @TXT FCC " A LINE OF TEXT "
7FDF 204C495354494E47          255 @TXT1 FCC " LISTING  THREE "
7FEF 39                        260 @OUT RTS
7FF0                           260       END @START
265 FORC=0TO8
270 CLSC:EXEC
270 SCREENO,1
280 FORD=1TO3000:NEXTD,C
GOTO265
```

LISTING #4

```
100 '****************************
105 '*TEXT IN M/C CODE PROGRAMS*
110 '***USING PSUEDO-OP 'FCC'***
115 '****************************
120 CLEAR160,&H7F60
125 EXEC &HCFFA
130 ALL:FML
135 @START EQU *

7F61                 139     PRT
7F61                 140 ****************************
7F61                 145 *  THE ASSEMBLER LISTING  *
7F61                 150 ****************************
7F61                 155 *###PARK THE REGISTERS ON#*
7F61                 160 *###THE SYSTEM STACK,THEY#*
7F61                 165 *###MAY  HOLD  VALUES FOR#*
7F61                 170 *###USE IF THIS PROGRAM ##*
7F61                 175 *###IS A SUB ROUTINE IN ##*
7F61                 180 *### A M/C CODE PROGRAM ##*
7F61                 185 ****************************
7F61 3436            190     PSHS A,B,X,Y
7F63                 195 *## DON:'T TRUST THE BINMEN##
7F63 5F              200     CLRB
7F64                 205 *##  1ST PRINT POSITION   ##
7F64 8E04A8          210     LDX #1192
7F67                 215 *#STORE AT CURSOR POSITION
7F67 BF0088          220     STX $88
7F6A                 225 *##     FIND 1ST CHR:     ##
7F6A 108E7FC2        230     LDY #@TXT
7F6E                 235 *## IF THERE IS A LEADING ##
7F6E                 240 *##    SPACE IN TEXT      ##
7F6E 108C0020        245     CMPY #32
7F72 2704            245     BEQ @SPC
7F74                 250 *## 1ST CHR TO ACCUMALATOR #
7F74 A6A5            255     LDA B,Y
7F76                 260 *##     AND INVERT IT     ##
7F76 8A20            265     ORA #32
7F78                 270 *##:ELSE INVERT THE SPACE  ##
7F78 8A80            275 @SPC ORA #128
7F7A                 280 *##  PRINT ROUTINE IN ROM ##
7F7A BDB54A          285 @NLET JSR $B54A
7F7D 5C              290     INCB
7F7E                 295 *## GET NEXT CHR:POINTED  ##
7F7E                 299 *##   TO BY THE COUNTER   ##
7F7E                 300 *##  PUT INTO ACCUMALATOR ##
7F7E A6A5            305     LDA B,Y
7F80 8120            310     CMPA #32
7F82 2704            310     BEQ @SPC1
7F84                 315 *##    INVERT THE CHR:    ##
7F84 8A20            320     ORA #32
7F86 2002            320     BRA @NOSPC
7F88                 325 *##    INVERT THE SPACE   ##
7F88 8A80            330 @SPC1 ORA #128
7F8A                 335 *##  CHECK FOR LINE END   ##
7F8A C110            340 @NOSPC CMPB #16
7F8C                 345 *##  YES!GO FOR NEXT LINE ##
7F8C 2702            350     BEQ @NXWRD
7F8E                 355 *#    NO!GET NEXT CHR:    ##
7F8E 20EA            360     BRA @NLET
7F90                 365 *#ZERO:'B'REG:READY FOR NEXT#
7F90                 366 *##    LINE OF TEXT      ###
7F90 5F              370 @NXWRD CLRB
7F91                 375 *## GO FORWARD 58 POSNS:  ##
7F91 30883A          380     LEAX 58,X
7F94                 385 *##   STORE IT AT CURSOR  ##
7F94 BF0088          390     STX $88
7F97                 395 *##      GET THE CHR:     ##
7F97 108E7FD2        400     LDY #@TXT02
7F9B                 405 *#ACCUMALATOR-OFFSET INDEXED
7F9B                 410 *## PUTS IT INTO :'A' REG: ##
7F9B A6A5            415     LDA B,Y
7F9D                 420 *##       AND PRINT IT     ##
7F9D BDB54A          425 @NXLTR JSR $B54A
7FA0                 430 *##  POINT TO NEXT CHR:   ##
7FA0 5C              435     INCB
7FA1                 440 *##  GET IT INTO:'A'REGR:  ##
7FA1 A6A5            445     LDA B,Y
7FA3                 450 *##    FOUND LAST CHR:    ##
7FA3 C11B            455     CMPB #27
7FA5                 460 *#  YES! ##
7FA5 2702            465     BEQ @NEWLN
7FA7                 470 *##NO!OK,GO FOR NEXT CHR: ##
7FA7 20F4            475     BRA @NXLTR
7FA9 308849          480 @NEWLN LEAX +73,X
7FAC BF0088          480     STX $88
7FAF 5F              485     CLRB
7FB0 108E7FED        490     LDY #@TXT03
7FB4 A7A5            495     STA B,Y
7FB6 BDB54A          500 @NCHR JSR $B54A
7FB9 5C              505     INCB
7FBA A6A5            510     LDA B,Y
7FBC C109            515     CMPB #9
7FBE 2736            520     BEQ @RETN
7FC0 20F4            520     BRA @NCHR
7FC2 2041204C494E4520  525 @TXT FCC " A LINE OF TEXT "
7FD2 20464F52204D4143  530 @TXT02 FCC " FOR MACHINE CODE PROGRAMS."
7FED 4C495354494E4720  535 @TXT03 FCC "LISTING 4"
7FF6                 540 *# GET REGISTERS OFF THE ##*
7FF6                 545 *#  STACK,PC MAY HOLD A   ##*
7FF6                 550 *#    RETURN ADDRESS      ##*
7FF6 35B6            555 @RETN PULS A,B,X,Y,PC
7FF8                 560     END @ST#RT
565 FORC=0TO8:CLSC
570 EXEC
575 SCREENO,1
580 FORD=0TO3000:NEXTD,C
585 GOTO585
```

LISTING #5

```
10 CLEAR100,&H7F00
20 EXEC &HCFFA
30 ALL:DSP $0F00:FML:PAG 3
40 @START EQU *
7F01                 45      PRT
7F01                 95 ******************************
7F01                 96 *    ROM SUB-ROUTINE CLS     *
7F01                 97 ******************************
7F01 BDBA77          100     JSR $BA77
7F04 8E0421          110     LDX #1057
7F07 BF0088          110     STX $88
7F0A 108E7F53        120     LDY #@TEXT0
7F0E BD7F48          120     JSR @PRNT
7F11 8E0461          130     LDX #1121
7F14 BF0088          130     STX $88
7F17 108E7F72        140     LDY #@TEXT1
7F1B BD7F48          140     JSR @PRNT
7F1E 8E04A0          150     LDX #1184
7F21 BF0088          150     STX $88
7F24 108E7F92        160     LDY #@TEXT2
7F28 BD7F48          160     JSR @PRNT
7F2B 8E04C1          170     LDX #1217
7F2E BF0088          170     STX $88
7F31 108E7FB3        180     LDY #@TEXT3
7F35 BD7F48          180     JSR @PRNT
7F38 8E04E6          190     LDX #1254
7F3B BF0088          190     STX $88
7F3E 108E7FD1        200     LDY #@TEXT4
7F42 BD7F48          200     JSR @PRNT
7F45 7E7FE2          200     JMP @OUT
7F48 A6A0            210 @PRNT LDA ,Y+
7F4A BDB54A          210     JSR $B54A
7F4D 4D              220     TSTA
7F4E 2702            220     BEQ @NXLIN
7F50 20F6            220     BRA @PRNT
7F52 39              230 @NXLIN RTS
7F53 412050524F475241  240 @TEXT0 FCC "A PROGRAM TO PRINT TEXT IN M/C",0
7F72 434F44452E424F54  250 @TEXT1 FCC "CODE.BOTH QUICK AND EASY TO USE",0
7F92 414C574159532055  260 @TEXT2 FCC "ALWAYS USE A SUB-ROUTINE IF YOUR",0
7FB3 50524F4752414D20  270 @TEXT3 FCC "PROGRAM HAS REPEATED CALLS TO",0
7FD1 504552464F524D20  280 @TEXT4 FCC "PERFORM ONE TASK",0
7FE2 39              290 @OUT RTS
7FE3                 290     END @START
```

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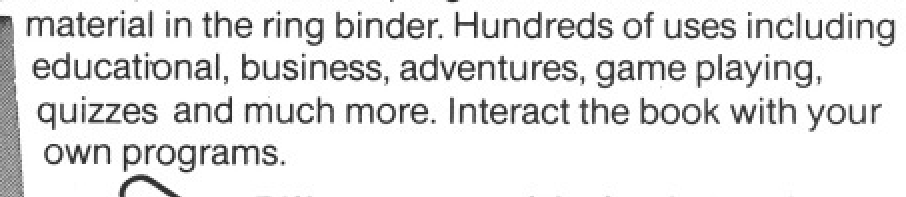
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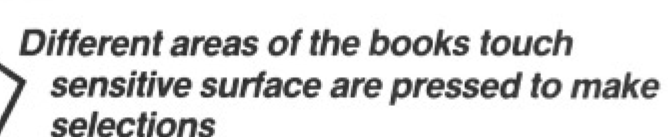
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Firmware

Brian Cadge explores the Dragon's ROM in a special series which builds up month by month into a firmware manual.

This month we take a look at the graphics and sound sections of the Dragon's ROM. These can be usefully used in machine code programs for setting up elaborate displays, and for playing music, but for fast action games customised routines will be needed.

Graphics and Sound Memory Map

The following decimal addresses are those used by the graphics and sound commands on the Dragon and Tandy machines.

134	Data for low-res SET/RESET routines
178	Current foreground colour in use
179	Current background colour in use
180	Temporary colour in use (colour given as parameter in command to override default settings)
181	Byte value for current colour (ie the value stored in a byte to set all pixels to that colour)
182	Pmode graphics mode number in use
183/184	Address of the last byte of the current graphics display
185	Number of bytes used per line in current graphics mode
186/187	Address of the first byte of the current graphics display
188	Start of graphics pages (MSB). Defaults to $06, ie address 1536 — changed by Dragondos etc
189	Current X cursor position — not user available
191	Current Y cursor position — not user available
193	Colour set currently in use
194	Plot/Unplot flag (0=reset, non-zero=set)
195/196	Current horizontal pixel number
197/198	Current vertical pixel number
199/200	Current X cursor co-ordinate
201/202	Current Y cursor co-ordinate
203/204	Circle command X co-ordinate
205/206	Circle command Y co-ordinate
208	Circle Radius
232	Current angle to be used in DRAW routines
233	Current scale to be used in DRAW routines
140	Sound pitch value
222	Current Octave in use (0-4)
223/224	Volume data for current volume setting in PLAY routines
225	Current note length for PLAY routines
226	Current tempo for PLAY routines

Graphics and Sound Firmware Routines

The following ROM routines can be used from machine code programs. The details of various commands like circle and paint are not given, as they cannot easily be used as stand alone routines, but see the 'DRAW' routine.

Set VDG Mode
Dragon 43401 Tandy 38395
Sets the VDG into the mode given in the A register. The mode will be displayed immediately.

Set VDG Offset
Dragon 43421 Tandy 38415
Sets the diplay offset for a graphics mode, eg to start a display at address 1536 the A register would contain 6 on entry. This routine also takes account of disks etc, so the same result will not occur if disks are attached — if A=6 then the display will start at graphics page 1, wherever that is.

Select Page
Dragon 43489 Tandy 38483
On entry the B register contains the Pmode page number to be used in subsequent graphics routines.

Select Col Set
Dragon 43536 Tandy 38530
Selects either colour set zero or one, depending on the value of the B register on entry.

Select VDG Col
Dragon 43428 Tandy 38422
Selects the required VDG colour set from the data in location 193.

Set Colours
Dragon 43304 Tandy 38298
Sets up the locations 180 & 181 from the data in locations 194 and 178/179. (See Memory Map for details.)

Select Display
Dragon 43320 Tandy 38314
Selects either TEXT or GRAPHICS modes depending on the Z condition code. If Z=1 then text, else sets up a display in current Pmode (location 182), starting at the address in locations 186/187.

Reserve HRG RAM
Dragon 43555 Tandy 38549
Reserves RAM for graphics and moves Basic program if necessary. The B register holds the number of pages to be reserved — ie this routine does a PCLEAR.

Clear Graphics
Dragon 43207 Tandy 38201
Clears the current graphics screen to the data in the B register on entry.

Calc Pixel Pos
Dragon 47656 Tandy 43225
On entry the top of stack must contain the low res vertical co-ordinate, preceded by the horizontal co-ordinate. On return the X register contains the address of the byte containing the low res pixel, and location 134 will contain the OR data for the pixel.

Set LRG Pixel
Dragon 47583 Tandy 43149
On entry the X register contains the screen address, the B register the colour and location 184 the OR data. The Pixel will be plotted on the low res screen.

Reset LRG Pixel
Dragon 47623 Tandy 43189
As for 'Set LRG Pixel' above, except the B register is ignored and the pixel is reset to black.

DRAW
Dragon 45137 Tandy 40118
This routine allows access to all the facilities of the DRAW command. Its use is as follows. On entry location 166/167 must point to a string of characters consisting of normal Draw commands, the first character must be code 34, and the last must be code 0. The A register should also contain 34 on entry.

Enable Sound
Dragon 47813 Tandy 43382
Enables 6 bit sound by setting bit 3 of the hardware location 65315.

Disable Sound
Dragon 47811 Tandy 43380
Disables 6 bit sound by clearing bit 3 of the hardware location 65315.

Beep
Dragon 47776 Tandy 43345
This routine sounds a beep for the length held in the B register. The pitch is set by location 140.

Play Note
Dragon 44698 Tandy 39679
The A register contains the ascii code of the note to be played. The various octave, tempo, volume and note length settings should be set up in memory before entry. (See memory map for details.) Sound must be enabled before calling this routine (use 'Enable Sound' routine).

This is the fourth in Brian's series on the Dragon's Rom routines. Next month, he will be covering Basic variables.

If you have missed any of the previous issues, you can get them from Dragon User *at £1.25 each including postage, packing and administration charges.*

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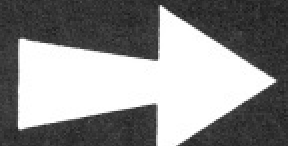
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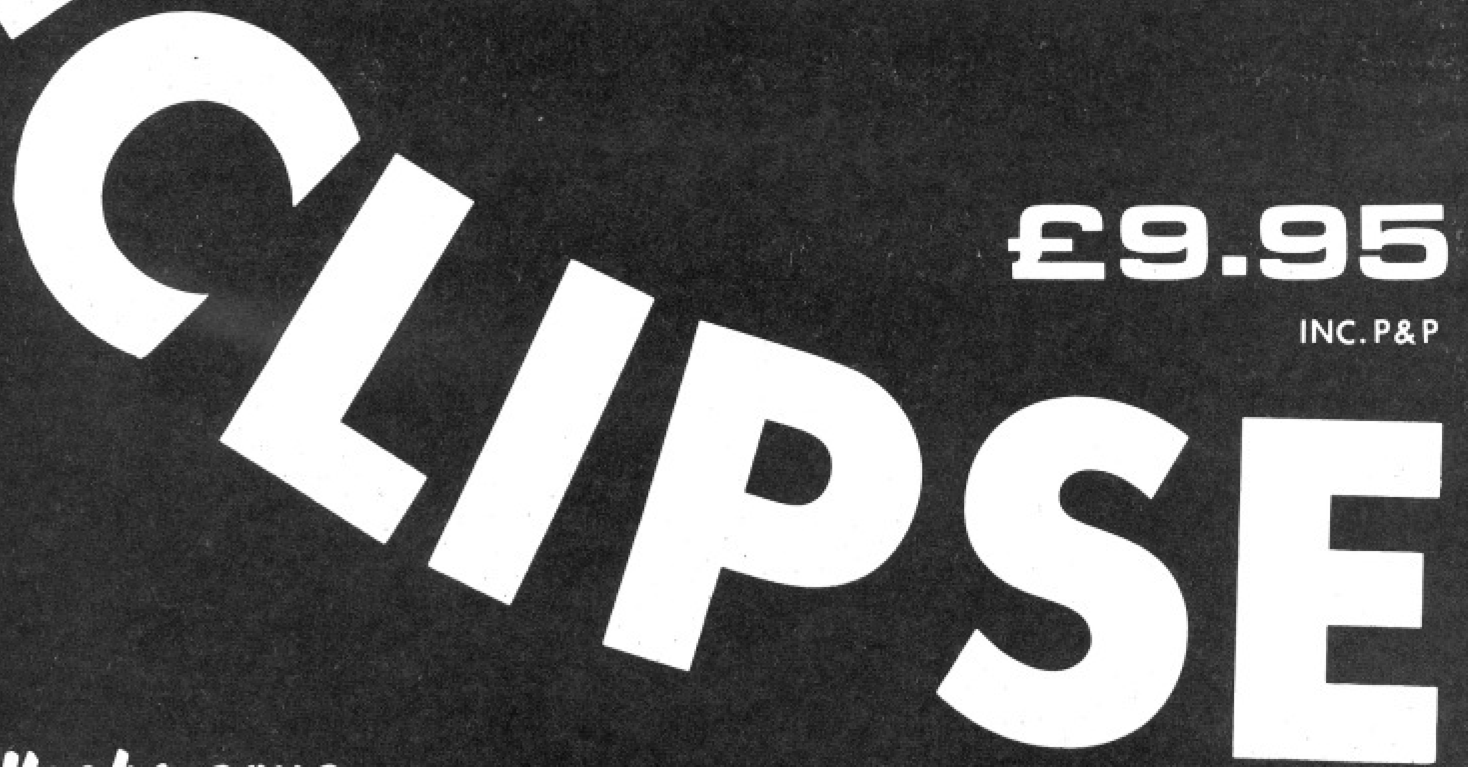
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Steve Gathercole shows you how to re-create a classic game from the arcades

The idea of this game is based on an old arcade classic in which you have to torpedo passing ships on the horizon, the game lets you define your own fire key each time you play and uses some nice smooth graphics.

To type in the game proceed as follows:-

First type in LISTING 1. This is the basic program which draws the simple background — the machine code does the rest of the graphics. When run, and the screen display looks okay, save this at the start of your tape using CSAVEM 'SCRN', 1536,7679,6144. Next switch the computer off and on again, then type in LISTING 2. This is the hexloader for the machine code. When run the program will ask you for the start address. This is the left hand column — ie 20000. Next type in the string of hex digits, (the middle column), and then the checksum (the right hand column). Continue this until the program ends then save this using CSAVEM 'GAME',20000,&H5459,20406 after the previously saved SCRN. To run the game type CLOADM=CLOADM=EXEC20406 or, if you want to save both parts as one game, load both parts into the memory then save the whole thing using SCAVEM'GAME1', 1536,&H5459,20406 — then just use EXEC20406 to run the loaded game.

If you have any problems then contact me at 16 Hankinsons Estate, Walpole St Andrew, Wisbech, Cambs. Please enclose an SAE.

LISTING 1

```
10 PMODE 3,1:SCREEN 1,0:PCLS
20 CIRCLE(127,97),130,4
30 PAINT(2,2),4,4
40 PAINT(2,192),4,4
50 PAINT(253,2),4,4
60 PAINT(253,192),4,4
70 COLOR 1
80 LINE(0,0)-(254,14),PSET,BF
90 COLOR2:LINE(0,0)-(254,14),PSET,
B
100 LINE(136,0)-(136,14),PSET
110 COLOR 3:LINE(2,1)-(253,13),PSE
T,B
120 COLOR 1
130 LINE(0,85)-(0,106),PSET
140 LINE(254,85)-(254,106),PSET
150 COLOR 4:LINE(0,97)-(254,97),PS
ET
160 PAINT(125,105),3,4
170 GOTO 170
```

LISTING 2

```
10 CLS
20 REM HEXLOADER - ENTER THE
30 REM STRING OF HEX DIGITS FIRST
40 REM AND THEN THE CHECKSUM
50 CLEAR200,19000
60 PRINT"ENTER START ADDRESS";:INP
UT START
70 PRINT"ENTER FINISH ADDRESS";:IN
PUT FINISH
80 FOR N=START TO FINISH STEP 11
90 PRINTN;":";
100 TT=0:INPUT A$:Z=0
110 FOR G=1 TO LEN(A$) STEP 2
120 P=VAL("&H"+MID$(A$,G,2))
130 TT=TT+P:POKE (N+Z),P
140 Z=Z+1:NEXT
150 PRINT" = ";
160 INPUT T$
170 IF T$ <>HEX$(TT) THEN SOUND 20
,30:PRINT"ERROR - ENTER LINE AGAIN
":GOTO 100
180 NEXT
```

LISTING 3

```
20000 5656565656565656155040 = 355
20011 0015400010554015504000 = 19F
20022 4000400015501540401040 = 1CA
20033 1040101540154040105540 = 1EF
20044 4040401015504000554040 = 24A
20055 0015501550400015400010 = 16F
20066 5540401040105550401040 = 26A
20077 1015404010401040101540 = 1AA
20088 5550050005000500050015 = CE
20099 5040001540001055401540 = 1DF
20110 4010401040101540050015 = 15F
20121 0005000500154015404010 = 104
20132 0540100055501540401005 = 1A4
20143 4040101540050011005550 = 1A0
20154 0100054055504000554000 = 1C0
20165 1055401550400055404010 = 22F
20176 1540555040400100040010 = 18F
20187 0015404010154040101540 = 19F
20198 1540401015400010554000 = 19F
```

Continued overleaf

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```
20209 0000000000000000004000 = 40
20220 0010000001540055750155 5 = 17B
```

New software for review should be sent to *Dragon User*, 12-13 Little Newport Street, London WC2H 7PP.

Juxtaposition

Software: *Juxtaposition*, Wintersoft, 30 Uplands Park Road, Enfield, Middlesex EN2 7PT
Price: £6.95

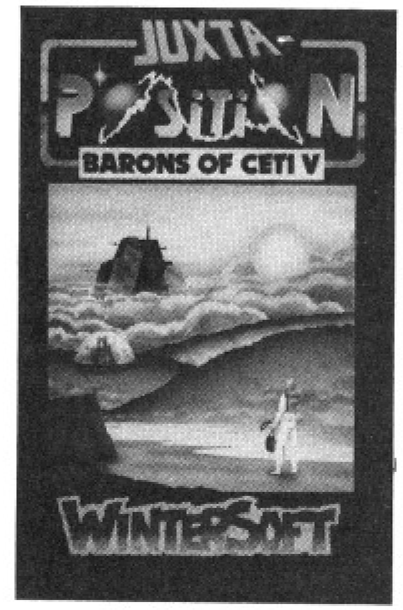
IT'S WELL over twelve months now since Wintersoft's last Dragon adventure, *Return of the Ring,* but the time's been well spent judging by the quality of their new mega-tale, *Juxtaposition: Barons of Ceti V.*

Fans of their earlier quests may or may not be delighted to know that there isn't a ring in sight in this new one, it's a completely fresh story — well, fresh to Dragon adventurers, though players with access to other machines might spot resemblances to adventures such as *Snowball, Return to Eden* and, most of all, *Lords of Midnight.* What, you say, all this on a Dragon? Almost, as the program must be a masterpiece of compression, with no subsidiary programs to load, as has happened in the past.

You are Cross — no, not because you've bought the adventure, that just happens to be your name, and you live on the planet Ceti V as a fairly low grade servitor, the planet being split into colour-coded sections and each one ruled by the appropriate Baron. You and a few million others are servitors to Baron White, living in a domed city in the middle of his lands.

The game begins with you waking in your tiny, poorly decorated apartment, a sort of Ceti V council flat, with seemingly the bare minimum for a happy existence: a bed and a Vidphone. A message comes through on the Vidphone, the equivalent of a Royal summons, it's Baron White himself sending you on a suicide mission to the lands of Baroness Black to find out why she hasn't attended the last few cabinet meetings and discover if she's got her hands on the secret of Juxtaposition, enabling her to cross the line of dimensional instability which passes right through Ceti V. Got that? Right, off you go.

As you're undertaking this mission on behalf of the Baron himself, you'd think he'd give



you a bit of co-operation and protect you from the dreaded droids which are patrolling the corridors outside your apartment, but no, you have to deal with them first, but that's not too difficult with a little careful observation of their movement habits. This first section is basically a text adventure, with a small picture of the domed city in the upper right of the screen. The text has been redefined for easier reading and a more attractive layout, and occupies the bottom half of the screen.

Superior

Examine every object you can and you should find a way of getting down to a slightly superior set of apartments below yours, and if you can deal with the patrolling droid here you get yourself a blue key card allowing you through the locked doors that lead to the city itself.

Almost immediately you come across an airlock, though something tells me it's not wise to step through here just yet. Wandering round the "Endless Rez Zone" for a while convinced me I was heading nowhere fast, but after finding a monocar I was able to travel to four different parts of the city, in one of which was an ultra-modern Lasertheque, with a girl saying "Let's Dance." After umpteen Terran Twists and being accused of making improper suggestions, I left her for a while and explored elsewhere. This led to me finding a breather mask, at which I rushed for the airlock and found myself outside the domed city.

Out on the surface of the planet itself the game switches to a *Lords of Midnight* landscaping style of game, though you're still entering text commands underneath. The top half of the screen shows you your current view and you can look in any of the eight compass directions, with the up arrow key moving you forward in the direction you're facing. The speed with which your viewpoint changes is incredible, faster even than *Lords of Midnight,* I would say, and you can whizz around the landscape — graphics have obviously been kept simple, and you do notice slight duplications of mountains and forests here and there, but this doesn't detract from the very impressive effects. Don't whizz round too quickly, though. I set off in one direction and found myself in the lands of Baron Red, unable to get back again before I was spotted by the Baronial Choppers. Not being able to furnish the appropriate ID card, I was zapped without mercy. Curse you, Red Baron!

Thanks to the SAVE facility I returned to Baron White's domain, and made sure I stayed there. I found a pyramid which I was able to enter, but the only thing inside was a wide cavern leading nowhere, so that's something to come back to later. I eventually found a fort, inside which was a maze of pillars, not to mention ever-present electronic eyes watching me, but at last I made contact with the Baron himself, who gave me a red ID Tag. Scurrying through the Red Baron's lands I found another pyramid, a tower, and eventually a domed city bearing a remarkable resemblance to the white one I'd left. In fact it was identical . . . almost. But it did give me chance to stock up on food from the dinner droid and restore my health to a sae state — you have to eat once a day, with SCORE showing you not just what percentage of the game you've done, but your current bill of health

Out again on to the planet, I obviously had to find the home of Baron Red, but such is my luck I wandered off into Baron Brown's lands and was reduced to a pile of smouldering aventurer yet again. All this playing, and still only 8% completed. Mapping the planet's surface is a tricky business, as there are apparently 4,000 locations, and of course you can move off in any one of eight directions from most of them, the exceptions being the mountains which border the map. You have to really keep your eyes open and try to spot potentially interesting buildings in the distance, then head for them. If you want to map this lot properly I'ds suggest you go out and buy yourself a roll of wall paper.

Complex

As if 32,000 viewpoints wasn't enough, the text parser is equally complex, coping with long sentences — yet ironically having trouble with shorter ones, sometimes. You have to try several variations on a command to hit upon the right combination of words. You can also speak to other characters using quotation marks, such as SAY TO DINNER DROID "SAUSAGE EGG AND CHIPS PLEASE", as well as get them to carry things for you, but as yet I've only found the unco-operative girl and a few droids so I think there's more of this still to come.

After a couple of days' play, the adventure itself looks like it's going to be fairly straightforward, and possibly a little repetitive — I sincerely hope that when I get to the Red Baron he isn't going to give me a Brown ID Tag, which I then take to the Brown Baron etc. But I still have a few objects I haven't yet been able to make use of, so maybe it'll get more complicated thatn that. And I've also a feeling the apparent similarity of the cities is going to be deceptive. Apart from these slight reservations, then, I'd say *Juxtaposition* looks like being one of the best programs you're likely to see on your Dragon this side of Christmas, and maybe even the other side as well. Programmer John Humphreys deserves all credit for squeezing more into the Dragon than you'd have thought possible, and my guess is it'll be an even bigger seller than Wintersoft's earlier successes.

Mike Gerrard



Dark Star

Program: *Dark Star,* Design Design, 125 Smedley Road, Manchester M8 7RS
Price: £7.95

FROM THE people who brought you *Rommel's Revenge* and (ahem, ahem) *Tubeway Army* comes quite simply the best 3-D game for the Dragon since — you guessed it — *Rommel's Revenge!*

Dark Star puts the player in the role of Luke Skywalker, Captain Starbuck, Buck Rodgers, or any other space hero from Dr Who to Hari Seldon, flying through space, diving towards the planet to loot fuel and destroy everything else, in runs that George Lucas would be envious of!

The game places you literally in the pilot seat of a small craft. The controls are simple. By adjusting your sights you also control your roll, climbing, and diving. You can fire, accelerate, and decelerate. And that is it for controls. Very simple, right? Wrong. At least not when there are what seem like 15 billion alien ships (usually there are actually two or three!) all opening fire with equal vehemence upon your timid little craft.

The game is very simple (in fact so simple that it could become boring after a while) but seems to have an extraordinary addictive quality that makes me want to keep playing for aobut an hour and then suddenly bores me.

There are enough options to set up a game for every day in the year, and they can certainly cater for any player's level of expertise. You can choose to use one or two joystick options or set his own keys for keyboard play.

You then choose difficulty level, type of enemy missile, and other options and launches into space.

The game operates in 3-D and is graphically stunning. The graphics are simple but fiendishly effective and the speed at which they moved seems to have no effect on the smoothness and clarity of screen action. The planet is depicted simply and effectively and the feeling of diving and climbing is quite superbly gut-wrenching!

The game is a must. I have given it five stars. It probably only deserves four and a half as I'm not yet sure of its durability, but seeing as Design Design have done this on the Dragon thus continuing to support our micro with quality sofware it gets five!

Jason Orbaum



Trekboer

Software: *Trekboer,* Microdeal, 41 Truro Road, St Austell, Cornwall
Price: £8.00

A NEW graphics guest to gladden the hearts of Dragon adventurers, coming as it does from the same stable which produced *Shenanigans, Sea Quest, Black Sanctum* and *Calixto Island,* and just in case you'd forgotten those you'll be reminded should you find the advertising leaflet hidden somewhere in the first few locations.

The screen layout is identical to those earlier titles, as is the style of the graphics with their occasional moving sections and flickering lights — flickering in this case because you're aboard the hi-tech Trekboer, a starship from the 21st century when life on earth is threatened by a deadly virus. All you have to do is search the known universe till you've found a cure. No problem.

First location is the control room, with a couple of buttons to press, a plaque and a view screen to look at, and a ladder to climb up. Moving around, there's a teleporter room, dusty storage room, communications room and environmental control room. There's also a pitch black room, which I haven't yet figured out how to illuminate, and a few possibly useful objects. After a certain number of moves a message comes through from Boer Control telling you that plague is still rampant, Xendos is the only known cure, there's been no contact with the Veldboer starship for three months and their last known co-ordinates were 8350.

Setting the controls for 8350 brings up a planet on the view screen. Next step was a little tricky, but after being ejected into space a few times I finally worked out how to get down onto the planet's surface, and if nothing else then the graphics here are even more interesting. Your view of the planet scrolls across the graphic window, and after a little searching I found the wrecked Veldboer, a virtual copy of the ship I'd just left, except that everything is dead and empty — though that wretched pitch black room is still there.

I don't want to give too much away, but something here should show you a way of visiting a frozen planet, and there you might learn something to help you find your way to a beautiful garden planet, though not as beautiful as it might sound as I plunged to my death here trying to cross a bridge that wouldn't bear my weight. Nasty, but not as nasty as returning to earth, I imagine, which I haven't yet tried to do.

The adventure unfolds nicely, opening up well yet you somehow always have to leave something behind that you're sure you'll need to go back to. A convincing story and some nice effects, and I think an even better effort than its enjoyable predecessors. I can see the questions in the adventure column already!

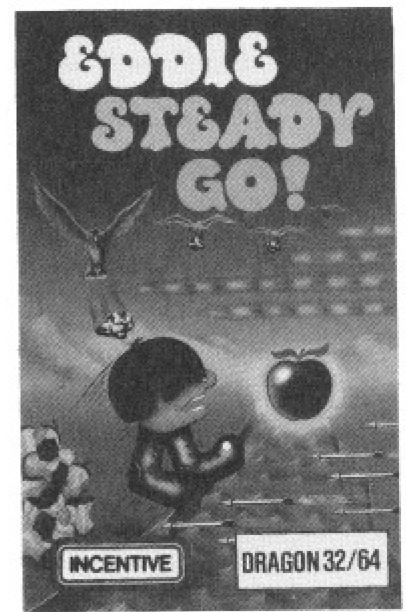
Mike Gerrard



Ready Eddy?

Program: *Eddie Steady Go!,* Incentive Software, 54 London Street, Reading RG1 4SQ
Price: £6.95

TIME FOR another rave! This game is all the usual adjectives for brilliant combine



with another few thousand that you've never heard of ('cause I've made them up!) so I haven't bothered to print here!

This is a deceptively simple concept that owes a lot to *Manic Miner* (surprise!) but has also successfully devolved it into something less complex, but even more exciting and addictive.

The story runs that having finally escaped the vicious labyrinth tests (*sic*) in *Back Track,* this guy Eddie now has to go through a crazy assault course that the malicious processor has designed for him.

There are three controls (left, right, and — you guessed it — jump), and the aim on each screen is simply to get Eddie from one side of the screen to the other, *vis-a-vis,* left to right.

To stop him are arrows, lazers, frogs, pits, rivers, etc, and they are usually (although not always) coming from the other side of the screen. It owes a lot to Hunchback, especially the look of the early stages.

The thing that sets this game up above its brothers is (as is usually the case with quality programs) its design. The screens really do get progressively more difficult, with screens that appear simple thrown in, which, of course, have a catch (the notable one being a screen involving simply precise running and jumping but with a horrifically short time limit).

I've hardly stopped playing *Eddy Steady Go!* since I got it. There are 22 screens, I'm on number 17 but progress has become slow in comparison with the early screens. One of the most notable things about it is the way that individual people find different screens easy (one man's thingy is another man's other thongy, or something like that)!

It plays through at the normal speed, and then when all 22 screens are complete, it plays again at medium speed, and then fast.

The sound is more than vaguely *"Shaper"*ish but then one can't have the perfect game, that would be too much to ask. This one's nearly there though.

Lustrous — and you can quote me on that!

Jason Orbaum



Show?

Program: *Show-jump*, Computerware, PO Box 318, Stoke-on-Trent ST6 6UX
Price: £6.50

I, FOR one, have never really had much interest in show jumping, probably due to a blind fear of horses! However, that is not to say I do not know what it involves. I would be able to tell the difference quite easily between, for example, show-jumping and organised crime, or, to use a more appropriate example, show-jumping, and Computerware's *Show-jump* program.

Years ago, in pubs, there was a neat little game called *Stunt Biker*. What you had to do was drive a cute little graphic Hell's Angel biker over ramps and jumps.

In this game, you control a cute little Princess Anne as she trots over various jumps. The ramps have gone, the game is now more complex: you have a jump button.

This game has been badly classified (and anyway the "horse" could just as easily be a stunt bike with the quality of definition!). That is not to say it's a bad game. It's just lost some of its prospective market; I mean surely something like *Speedy Stunt Man* would sell more copes than *Show-jump*?

Thus endeth the first lesson in creative marketing.

I'd love to be able to go on to say that the game itself was a superbly addictive challenge. Oh well, another unrequired love!

Show-jump consists of a horse jumping fences of various length and height spaced over several lines on the screen (the horse goes left to right on the top line, then the second, and so on to the end of the event). The controls are accelerate, decelerate, and jump. Basically, you want a lot of speed for the long jumps and very little for the high ones. And that's it.

There are nine courses, which would be nice if there was any real variation between them other than slightly taller and longer jumps, more frequently on the later courses.

The game has a "jump-off" option for two tying competitors which I was fortunate enough never to require. All in all it does seem to be a well written and thought out program.

It is sad that this game is so (. . . look out . . . ugly word alert . . .) boring. It just doesn't make me want to load it. It is suffering from the length-grab problem.

Jason Orbaum



Mailbox software

Program: *Mailbox*, Harris Micro Software, 49 Alexandra Road, Hounslow, Middlesex TW3 4HP
Price: £14.99

MAILBOX is a new name and address database program for the Dragon 32 and 64 with Dragondos, from Harris Micro Software, the company that produce the *Moneybox* program.

As with *Moneybox* (disk version), *Mailbox* uses Harris's custom 42×24 screen and keyboard driver which produces a very clear and pleasant display, including full lower case and so on. *Mailbox* can handle up to 99 separate files on one disk (named MAIL01 to MAIL99) of variable length. Each file contains records of names and addresses plus up to 10 user defined fields.

The program is menu/form-fill driven, and has extensive input error checking. The first thing to do is to select the CREATE file option. Information on the size of the file and the number of user defined fields is required for the program to then create the empty file on a data disk. *Mailbox* always assumes that you only have a single disk drive, so prompts are output to swap program and data disks when required.

The idea behind user defined fields is that you can store extra information, such as occupation or age, about each person on the file. These user defined fields are given names and formats by another option from the main menu. Three formats are available. "Alpha" simply means any character, "Num" means numeric only, and "Date" means only dates will be accepted (the characters 0-9 and "/"). Whenever there is a request for data the "format" required is displayed at the top of the screen.

For quickly locating entries a "short-form" of the name is entered for each record. For example, for Fred Smith one might use SMI-F. This short-form is also used by the program for sorting the records into alphabetical order before sorting.

Requests for information are signalled by a flashing cursor enclosed within <> brackets. System prompts, such as "Press any key" appear on the bottom line of the screen as do any error messages generated. Pressing the down arrow key with shift produces a line of help information at the bottom of the screen which cuts down on repeated references to the manual. Pressing shifted up arrow returns you to the main menu, that is, it aborts the option selected. Sensibly, the Break key has been disabled and has no effect.

Once you have entered your data, it can, if necessary, be edited by selecting this option from the main menu. Records are selected by entering the Short-form of the name. The program will attempt to find the nearest match for you if you include the "wild card" character "?". For example, if you want to edit the record of a Mr Smith, but can't remember his first name you might enter SMI-? as the short-form. When a match is found you can either accept it to edit, or scroll forward or backwards through the file.

This method of retrieving records is also used for the "view", "delete" and "Print" options. When printing is selected the program can make use of another field that can be entered for each record, the "Salutation" field. This is the "Dear Fred" part of a letter head. The program always prints "Dear", so it is only necessary to enter the "Fred" part in the salutation field.

A final option in the *Mailbox* menu is to "Run Report Program". This loads and runs another program from the *Mailbox* disk, used for most of the printing options. The Report program allows address labels to be printed, the user can set the horizontal and vertical tabs for the particular type of labels being used.

Most of the Report Program options depend on selecting batches of records using selective tests on the fixed and user defined fields. It is possible to select certain names, towns and regions using the wild card character once again. The testing on user fields is possibly more useful. The tests available are =,<,>,<>,<=, and >=. As an example, if a file contains a user defined field, number 10, which is called "Occupation", you could select only the records where occupation is "Programmer" by the following test: IF 10 = PROGRAMMER

In addition to "IF", "Either" and "OR" is allowed, several tests can be combined for very powerful selection of particular records. The other main option of the Report Program is to display or print selected fields from selected records in the form of a report, with automatic totalling of numeric fields.

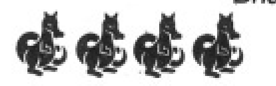
There are two more programs on the *Mailbox* disk, "MAIL PURGE" and "MAIL MERGE". The former allows selected records to be deleted in bulk from a file, and the latter allows different files to be merged together. Neither of these two programs use the 42-column screen which seems to tarnish the professional feel of the software a bit, I would suggest that these two programs were rather hurriedly written to get the software out.

Mailbox is undoubtedly the best Name & Address file management program I have seen running under Dragondos. The screen display is excellent, the keyboard has a variable autorepeat speed, and the help messages make the program very user-friendly.

The manual is also very well written with useful examples. With its very powerful selection options and user-defined fields this program is ideal for a small business which needs to hold simple customer records, or a club or society. The price is also just about right for disk software of this type. Harris deserves to do well with *Mailbox*.

Not perhaps one for the Christmas stocking, though — unless your loved one is a small business!

Brian Cadge



If you've got a technical question write to Brian Cadge. Please do not send a SAE as Brian cannot guarantee to answer individual inquiries.

Dragon Answers

C SAVE

I HAVE been trying to write a program which has to read in a program that has been saved by CSAVE"".

When I save a program this way, I always get an IO error at the beginning of the last block of information when loading it back in.

This means I cannot load or read the last block. Is this a common fault, or have I got a problem with the computer?'

C Tuckwood
Plymstock
Devon

THE following program reads in a program previously saved with the CSAVE"",A command line by line. This could be used as part of a custom editor for example. You should not get I/O errors with this program; if you do then the most obvious fault is your cassette deck, or less likely the computer itself.

```
10 Open "I", -1,""
20 IF EOF (-1) THEN 60
30 LINE INPUT #-1,A$
40 PRINT A$
50 GOTO 20
60 CLOSE -1:PRINT "END-OF-FILE"
```

P POINT

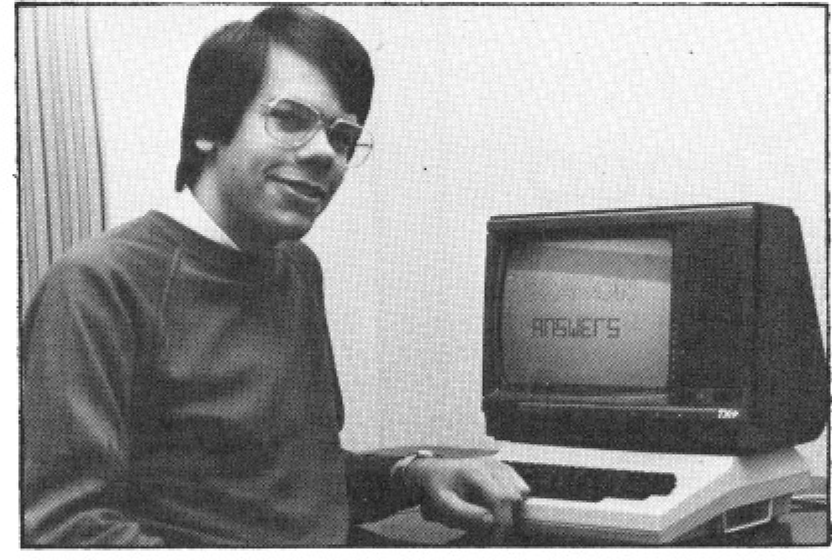
COULD you please write a small program demonstrating PPOINT and how to use it. The manual isn't a lot of help as it doesn't actually give a very good example.

I am a complete beginner and am trying to teach myself programming.

Linda Pugh

THE PPOINT command seems to create more confusion than most graphics commands. Its purpose is to return the colour of the pixel at the specified position. The program below should demonstrate this by changing any green pixels to blue and any red to yellow on every other line.

```
10 PMODE 1,1:PCLS:SCREEN 1,0
20 COLOR 4:LINE (10,10)-(80,80), PSET,BF
30 LINE (120,90)-(220,170), PSET, BF
40 For Y=0 TO 191 STEP 4
50 FOR X=0 TO 255 Step 2
60 C=PPOINT (X,Y)
70 IF C=4 THEN PC=2
80 IF C=1 THEN PC=3
90 PSET (X,Y,PC): NEXT X,Y
100 GOTO 100
```



Variable pick up?

I'VE been working on a machine code routine that needs to pick up specially reserved variables incorporated in a Basic program, look through the Basic Variable table and, after converting the five byte floating point number to an integer, pass it to the machine code table.

Something is not right, as all the variables return the same number from the first variable name — as in the short program example below:

```
10 CLS
20 FOR P1=0 TO 512
30 FOR P2=0 TO 256
40 ENVELOPE (P1, P2, etc)
50 NEXT P2
60 NEXT P1
```

The variable P2 returns the same value as P1.

Inside the Dragon has been my main source, especially the 'Number Representation' section, but I need more help.

Richard Brooks
Croydon Surrey CR0 3DE

THE simplest way of incorporating a routine such as this is to use the EXEC command with parameters. For example, the Envelope command could be written as a routine at address 30000 which could be called as;

```
40 EXEC 30000,P1,P2
```

The first part of the routine would read as follows

```
10 ORG 30000
20 JSR 35242 ;Skip comma
30 JSR 36483 ;Get P1 in X
40 STX P1
50 JSR 35242 ;Skip comma
60 JSR 36483 ;Get P2 in X
70 STX P2
  . .
  . .
500 P1 RMB 1
510 P2 RMB 2
```

Beeb data

IS IT possible to transfer data from a BBC computer to the Dragon 64? I wish to use a large amount of data and so cannot re-enter it directly into the Dragon. I have a disk drive and the BBC data is on disk.

Peter Bennett
Hindlip
Worcester

THE BBC disk format is not directly compatible with the Dragon disk system. The easiest method of transfering data is to use an RS232 link. The Dragons' DLOAD command could be used, but this would mean writing code on the BBC to send data in a standard Dragon file format. A simpler solution would be to write a small program on both computers to send and receive the data on a character by character basis, saving the data to disk on the Dragon as it is received using FWRITE.

Interrupts

I HAVE recently been trying to understand the use of interupts and how these are initiated in a program. My interest is in their application to games programming.

E Tomlinson
Preston

THE START address of an interupt routine is placed in locations 269/270 and the routine must end with a JMP 40253 (or JMP 50944 for Dragondos) rather than a RTI.

It is not necessary to 'call' an interupt from a program; the routine will automatically be executed every 50th of a second transparently to the program running at the time. If you want to use interupts which are called from the program you should use 'Software Interupts', initiated by the SWI instruction. The address of the interupt routine should be stored in locations 263/264 and the routine should end with a RTI. The SWI instruction automatically saves all registers and the RTI automatically restores them.

Structure

I AM attempting to structure my Dragon Basic.

I would be grateful if you could help me overcome some of the problems I have encountered.

How does the Dragon evaluate such expressions as (A<B) OR (A>B)?

How do I access and use CLOADM, CLOAD and SKIPF?

Kevin Coward

THE Dragon, in common with most Basics, evaluates true/false expressions, such as (A>B), as 0 for false, and -1 for true. In fact, the Basic will allow any non-zero value to signify a 'true' status.

For details of the Cassette I/O routines see *Dragon User* October 1985. The evaluation routines you mention return the value of the following number in the B and X registers respectively. The only pointer used is the 'Text Pointer' at address 166/167 which should point to the first character of the expression.

Dancing

WHICH locations are affected by sound input from the cassette player? I wish to write a bar graph program which will 'dance' to the music entered from the tape.

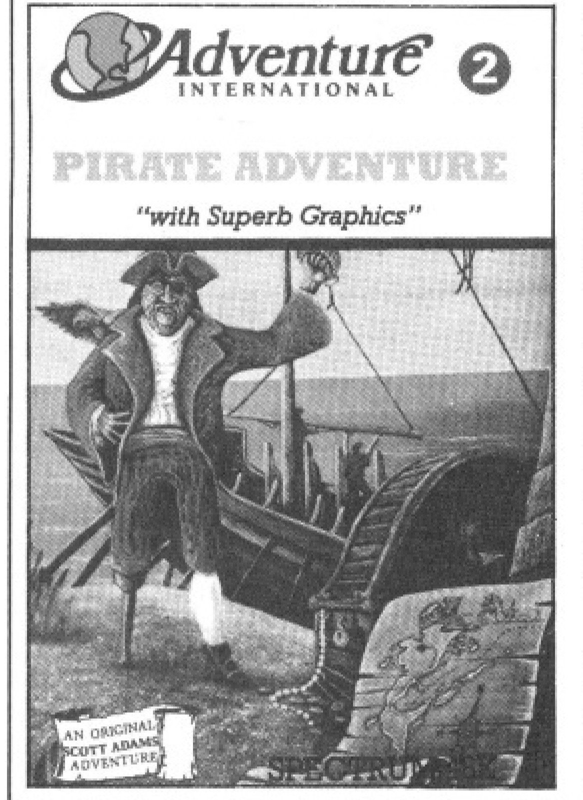
N A Shelkh

THE ONLY hardware location affected by the cassette input port is $FF20 – bit 0. By sampling this bit a number of times in a loop, it is possible to obtain the frequency of the sound coming in which can be used within a 'bar-graph' program such as you describe.



CHRISTMAS is coming, the goose is getting fat, and no doubt if you put a few pennies into Adventure International's hat they'll be delighted to supply you with your choice of Scott Adams' adventures this Yuletide. Which you choose is up to you, but whichever it is I doubt if you'll be disappointed with the challenge of a Scott Adams title. The two I'll be looking at this month have very distinct scenarios. *Pirate Adventure* should obviously cater to the pirates amongst our readers, whilst *Voodoo Castle* should cater to . . . well, we won't go into that.

Pirate Adventure is actually the second in the lengthy Adams' series, and was in fact written by Scott jointly with his wife Alexis. Scott's first adventure, *Adventureland* (reviewed last month), allegedly occupied so much of his spare time that his wife at one point put the master disk of the game in the family oven. Fortunately for all concerned she didn't turn the oven on, and obviously it didn't take long for her to be bitten by the adventure bug herself. For her first attempt at authorship she chose a desert island setting, though the opening location seems to be fairly hum-drum, being a flat in London: a hum-drum drum, as Arthur Daley might call it. At first it looks just like any ordinary flat, with a pair of sneakers lying on the floor, a rug, a discarded bottle of booze, a sack of crackers. A sack of crackers? No doubt there'll be a parrot lurking somewhere. And what's that sign on the wall? "Bring treasures here, say: Score."



Nailed

Taking what I could (the rug proved to be nailed to the floor) I went upstairs to an alcove, in which there was a bookcase, in which there was a book, in which there was a word written in blood on the flyleaf: Yoho. Sounds suspiciously like a magic word to me. The book itself is *Treasure Island*, and another message informs you that Long John Silver left two treasures there, which must be news to Robert Louis Stevenson but let's not quibble. There are a couple more locations in the flat, if you can find them, and then it's out on to a window ledge, provided you've done something to prevent yourself hurtling to the pavement far below.

Do everything right and you might find yourself on a sandy beach on some tropical isle. Resisting the temptation to get out the towel, rub in the sun-tan cream and settle down with the latest Jeffrey Archer paperback, I examined the lagoon and found that luckily the tide was out. I went boldly into the lagoon, found an immovable rusty anchor, went north and promptly discovered that *I* was out, out of the game and in "Never-never-land," from where every direction takes you nowhere. You can usually escape from a Scott Adams death, but seemingly not this one. I restarted and had the sense to explore the island before venturing into the lagoon again, and it's a good job I did, although I didn't think so while I was wandering around the maze of caves.

Apart from Never-never-land, *Pirate Adventure* had only 25 locations, and if you think that's small then *Voodoo Castle* is limited to only 23! With very little by way of text, you could probably fit these adventures into an unexpanded ZX-81, maybe even a pocket calculator, but with Scott Adams it's the puzzles that matter and it will take you a goodly while to uncover those paltry few locations, believe me.

Voodoo Castle is written solely by Alexis Adams and "dedicated to all Moms!" The moms among my readers will no doubt feel that's a good reason for buying it, while those with moms might feel it would make an excellent Christmas present. What, your mom doesn't like adventures? All the more reason, then. You, or your mom, begin the game in a chapel with nothing but a closed coffin for company. Taking our life in our hands we use the magic words OPEN COFFIN and discover not a rotting corpse but a sign saying "Count Cristo's been cursed! There's one way for him to flee! Find it, and he'll go free!" What can it all mean? And what about the man wearing the sapphire ring? Is he dead or alive? Who cares, give that ring here, it's bound to come in useful somewhere.

Heading north I walked into a room where the window slammed shut instantly, and wouldn't open again. I left that problem for later and headed south, which brought me to a dingy-looking stairwell and a dungeon with an open jail cell. It didn't seem a good idea to enter here just yet, so I pocketed the pocket shovel that was lying around and went instead into the torture chamber. I couldn't get through the tiny door that requires a bit of magic, but did go into the armory which contained a shield, a sword and a suit of armour. Or rather a suit of armor, this being an American adventure. Strangely, you could MOVE ARMOR, but nothing happened when you did.

Witch's brew

Next I wended my way past a room full of animal heads, another room with a pot of witch's brew, and finally into a lab containing several interesting items. There was a ju-ju bag, which I naturally tried to get to match up with the ju-ju man statue I'd already found. No dice, it was stuck to the floor. There were some chemical tubes, though taking these only prompted one of them to explode periodically and eventually kill me. There was also some labelled chemicals. I was informed, on examining them, that they appeared to be mixable. Is this a good move? Maybe not. By the time I found a secret tunnel leading to a slippery chute down into another room, the exploding tubes had got me . . . what a painful way to go.

For all their brief text and few locations, I think any adventurer worthy of the name ought to try tackling these titles from the Adams family.

Philip Blazdell of Biggin Hill has been trying a later Scott Adams effort, his adventurisations (if there is such a word) of *Spiderman*, and has kindly sent in a few clues for the benefit of other readers.

IT'S ON AGAIN!

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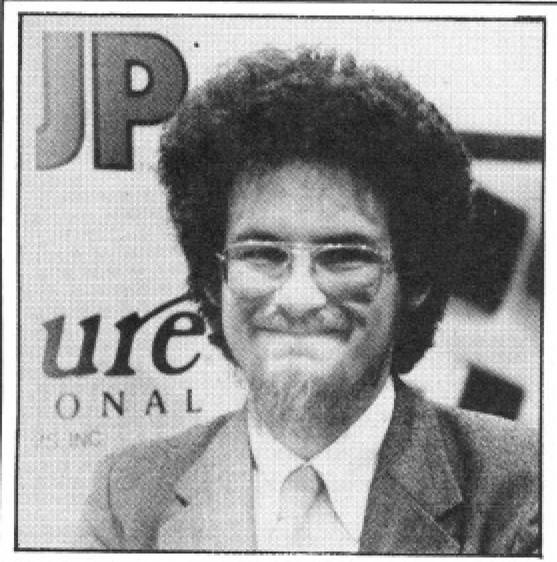
Express card No: ____________ Signature: ____________

Name: ____________

Address: ____________

Postcode: ____________

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Scott Adams

When you can't go any higher in the elevator, PUOG NEHT DNAP UHSUP; if the fan is proving a problem, TITA BEWT OOHS; and if Hydroman is a problem to you, MIHE ZEERF.

Another helpful reader is Alan Millhouse of Nottingham, who has sent me a copy of the introductory notes that should accompany *El Diablero*. Alan thought those readers who have bought the adventure without the cassette inlay might appreciate a copy of these, so if anyone would, then write and ask me nicely, as well as enclosing a stamped addressed envelope, and I might just send you one. If you're well into the game then it won't help you much, but if you're having trouble getting started then it might prove useful.

G Evans of 10 Kent Close, Penymynydd, Clwyd CH4 0LQ is having trouble with *Mystery of the Java Star*, having spent many late nights on board a shipwreck looking for the Java Star. If anyone can help him, or her, please write to her, or him, at the above address. Any reader who sends in SAE with their queries will be sure to get a reply, but the naughty ones who don't will have to wait till the letter can be dealt with in the column itself. If you can't bear to wait several weeks for it to appear, the answer's simple: EASE SOLC NE!

Gerrard Saunders didn't even include an address with his queries on *The Ket Trilogy*, so if you want to write again, Gerrard, I'll do my best for you (we're very pushed for space, this month.)

Not too pushed to thank S E Woodbury of Bromsgrove who sent me a map of the various floors in *Mansion of Doom*, along with some playing hints. Someone obviously making use of the school holidays, as the letter dates from the end of August. One tip from among many relates to moving the snake: TAHTE SUDN AESO OGNO MEHT EGAC.

Help on *Black Sanctum* is offered by John Tomes, 79 Lakeside Court, Brierley Hill, West Midlands DY5 3RQ, but John asks for a stamped envelope as his pocket money doesn't stretch very far. A hint on *Syzygy* from R A Read of Manchester, who points out that there are no space suits without holes in them, but to use the corridor type: HTAE RBDL OH. That should help Andy Hughes of Hertfordshire, who wrote in asking about just that point.

Damian Griffiths of 163 Sycamore Avenue, Burnley, Lancs BB12 6AS seems to have completed about six million adventures, but not *Syzygy*, for which he'd like someone to tell him how to obtain the communicator. Some bugs on *Quest*, which Damian's discovered, are that to gain items you can drop a minus quantity and you can also double your wealth by selling your coins for 1½ coins each.

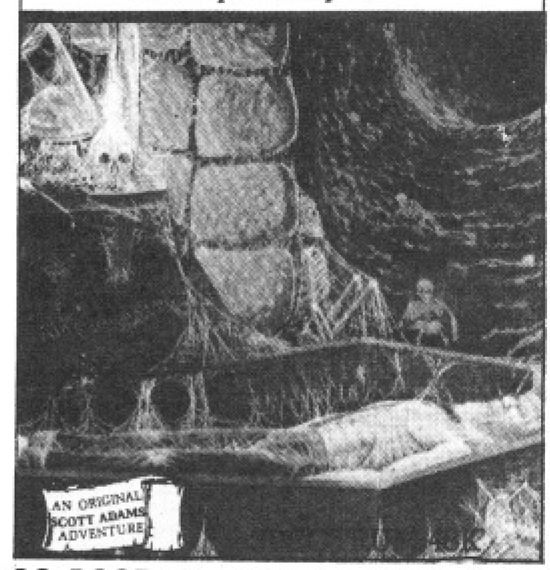
Thanks

I'd like to thank all the readers who have written in with queries and offers of help, and apologise if I haven't featured your letter because space doesn't allow a mention of them all. One I would like to mention is from Gillian Keys of Bangor in Northern Ireland, who asks for some general help on vocabulary for beginners to adventure games. This is something I think we forget once we've played a few, but it's very important to get used to those abbreviated two-word commands. LOOK WINDOW,



VOODOO CASTLE

"with Superb Graphics"



GO DOOR etc are common commands which seem to baffle some players. You can't type GO THROUGH THE DOOR/PASSAGE/TUNNEL or whatever, so simply GO DOOR. Likewise with looking at or through things, and the command LOOK often is a synonym for EXAMINE. That's something you must also learn to do, EXAMINE everything. This sometimes enables you to find concealed objects or secret passages, and some adventures even require you to EXAMINE some things twice, to produce two hidden objects. Always make a map, of course, and always read this column. More tips next month.

Adventure Contact

To help puzzled adventurers further, we are instituting an Adventure Helpline — simply fill in the coupon below, stating the name of the adventure, your problem and your name and address, and send it to Dragon User Adventure Helpline, 12/13 Little Newport Stret, London WC2H 7PP. As soon as enough entries have arrived, we will start printing them in the magazine.

Don't worry — you'll still have Adventure Trail to write to as well!

Adventure ....

Problem ....

....

Name ....

Address ....

.... **Dec 85**

Adventure Contact

Adventure Return of the Ring **Problem** How do I get the red/blue passes; How to find use for the flask? **Name** Christian May **Address** 6 Swift Gardens, Woolston, Southampton, Hants, S02 9FQ.

Adventure Franklins Tomb **Problem** How do you get into the Water Tomb? How do you give the rabbit the carrots? How do you open the Sarcophagus? **Name** J P Thorpe

Adventure Black Sanctum **Problem** How to get through the boarded-up door (the saw doesn't help)? **Name** Stephen Wood **Address** 3 New Street, Stalybridge, Cheshire, SK15 2EZ.

Adventure El Diablo **Problem** I'm stuck in the cactus and all I did is going up on the Granite rock. **Name** Eyal bar svi **Address** Eshel Street 8/5, Kiryat Bialik 27000, Israel.

Adventure Return of the Ring **Problem** How do you get the moon walker in the inventory? **Name** Ian Griffin **Address** 69 The Serpentine, Aughton, Nr Ormskirk, Lancs L39 6RN.

Adventure Dragon Mountain **Problem** How do I get a drink of water? **Name** L Darnell **Address** 62 Riverview, Grays, Essex, RM16 4BD.

Adventure Calixto Island **Problem** How do you get past the natives on Calixto Island?

Adventure Syzgy **Problem** How do you use the transporter co-ordinates on the transporter? **Name** Louise Bonfield **Address** 7 Water End, Wresthingworth, Sandy, Beds, SG19 2HA.

Adventure El Diablo **Problem** Where do I dip the stick, how do I get to the cave in the cliff? **Name** Fraser Chadburn **Address** 47 Ibbeth Close, Kempston, Beds, MK43 9BU.

Cat and mouse!

A game for four to six year olds from ***Steve Gathercole***

THE IDEA of the game is to teach four to six year old children the alphabet and the position of the keys on the keyboard. When run, the game displays two little houses, one for a cat and one for the mouse. A letter is presented in the middle of the screen and the child must press that key; if the key is not pressed quickly enough or the wrong key is pressed the cat will start to catch the mouse. The idea is to get home before the cat gobbles you up! The alphabet is displayed in order and there are three levels of difficulty. Mum or dad should try their hand at level one — but be careful, you could show yourself up!

ARRAYS — BL = blank, MD = mouse down, MU = mouse up, MR = mouse right, ML = mouse left, CR = cat right, CL = cat left, HO = house

VARIABLES — CY = cat 'y' position, CX = cat 'x' position, MY = mouse 'y' position, MX = mouse 'x' position

LINES 90 — 340 pokes graphics to screen and sets up arrays
LINES 350 — 460 data for the graphics
LINES 460 — 620 data and routine for drawing letters on the high res screen
LINES 630 — 880 sets up and displays introduction screen
LINES 890 — 1060 main loop
LINES 1070 — 1630 subroutines for cat and mouse movement and check for end of screen positions
LINES 1550 — 1560 born free tune
LINE 1590 death march

MOUSE

```
10 REM MOUSE
20 REM FOR 4 TO 6 YEAR OLDS
30 CLS:PRINT@8,"CAT AND MOUSE";
40 PRINT:PRINT"********************
*************"
50 PRINT:PRINT:PRINT:PRINT"   AN A
LPHABET TEACHING GAME";
60 PRINT:PRINT:PRINT"      FOR THE
VERY YOUNG...";
70 PRINT:PRINT:PRINT:PRINT:PRINT:P
RINT:PRINT"      HANG ON A MINUTE"
80 PMODE 3,1:PCLS
90 DIM BL(15),MD(15),MU(15),MR(15)
,ML(15),CR(15),CL(15),HO(15)
100 DIM LE$(26)
110 GOTO 200
120 A=1536
130 FOR D=0 TO 2
140 FOR N=1 TO 24
150 READ S:POKE A+D,S
160 A=A+32
170 NEXT N
180 A=1536:NEXT D
190 RETURN
200 PCLS:GOSUB 120
210 GET(0,0)-(24,24),MD,G
220 PCLS:GET(0,0)-(24,24),BL,G:GOS
UB 120
230 GET(0,0)-(24,24),MU,G
240 PCLS:GOSUB 120
250 GET(0,0)-(24,24),CR,G
260 PCLS:GOSUB 120
270 GET(0,0)-(24,24),HO,G
280 PCLS:GOSUB 120
290 GET(0,0)-(24,24),CL,G
300 PCLS:GOSUB 120
310 GET(0,0)-(24,24),MR,G
320 PCLS:GOSUB 120
330 GET(0,0)-(24,24),ML,G
340 PCLS
350 DATA 0,0,0,0,0,0,1,5,5,5,5,5,1
,1,5,5,5,13,1,1,0,0,0,0
360 DATA 80,16,16,16,64,64,0,64,64
,64,64,64,0,0,64,64,64,192,0,0,0,0
,0,0
370 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0,0,0,0,0
380 DATA 0,0,0,0,1,1,9,5,5,5,5,1,1
,5,5,5,5,5,1,0,0,0,1,5,0,0,0,0,0,0
,128,64,64,64,64,0,0,64,64,64,64,6
4,0,64,64,64,0,0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
390 DATA 0,0,0,64,80,16,4,4,4,4,4,
17,68,84,80,64,64,64,64,64,64,16,5
,5,0,16,20,20,16,16,168,8,36,145,6
5,0,5,5,0,4,84,1,1,1,1,84,85,85,0,
16,80,80,16,16,168,128,96,8,0,0,64
,64,0,0,0,0,0,0,0,0,64,64
400 DATA 0,0,0,1,4,16,85,16,16,16,
16,16,16,16,16,16,16,16,16,16,16,1
6,16,21,20,20,65,0,0,0,85,0,5,4,4,
5,0,0,0,0,0,85,65,65,65,65,65,85,0
,0,0,64,16,4,85,4,68,68,68,68,4,4,
4,4,4,4,4,4,4,4,4,84
410 DATA 0,4,5,5,4,4,42,2,9,32,0,0
,1,1,0,0,0,0,0,0,0,1,1,0,4,20,20
,4,4,42,32,24,70,65,0,80,80,0,16,2
1,64,64,64,64,21,85,85,0,0,0,1,5,4
,16,16,16,16,16,68,17,21,5,1,1,1,1
,1,1,4,80,80
420 DATA 16,65,69,69,70,21,1,0,0,0
,0,0,0,0,0,0,0,0,0,0,0,0,0,0
430 DATA 80,84,85,149,101,80,84,0,
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
440 DATA 64,80,88,85,85,64,80,0,0,
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
450 DATA 1,5,37,85,85,1,5,0,0,0,0,
0,0,0,0,0,0,0,0,0,0,0,0,5,21,85,
86,89,5,21,0,0,0,0,0,0,0,0,0,0,0
,0,0,0,0,0,4,65,81,81,145,84,64,0,
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
460 FOR K=0 TO 26:READ LE$(K):NEXT
470 FOR K=0 TO 9:READ NU$(K):NEXT
```

```
480 DATA BR2,ND4R3D2NL3ND2BE2,ND4R
3DGNL2FDNL3BU4BR2,NR3D4R3BU4BR2,ND
4R2FD2GL2BE4BR,NR3D2NR2D2R3BU4BR2
490 DATA NR3D2NR2D2BE4BR,NR3D4R3U2
LBE2BR,D4BR3U2NL3U2BR2,ND4BR2,BD4R
EU3L2R3BR2,D2ND2NF2E2BR2
500 DATA D4R3BU4BR2,ND4FREND4BR2,N
D4F3DU4BR2,NR3D4R3U4BR2,ND4R3D2NL3
BE2,NR3D4R3NHU4BR2
510 DATA ND4R3D2L2F2BU4BR2,BD4R3U2
L3U2R3BR2,RND4RBR2,D4R2U4BR2,D3FEU
3BR2,D4EFU4BR2
520 DATA DF2DBL2UE2UBR2,DFND2EUBR2
,R3G3DR3BU4BR2
530 DATA NR2D4R2U4BR2,BDEND4BR2,R2
D2L2D2R2BU4BR2,NR2BD2NR2BD2R2U4BR2
,D2R2D2U4BR2,NR2D2R2D2L2BE4,D4R2U2
L2BE2BR2,R2ND4BR2,NR2D4R2U2NL2U2BR
2,NR2D2R2D2U4BR2
540 GOTO 630
550 DRAW"BM"+STR$(XX)+","+STR$(YY)
560 FOR K=1 TO LEN(A$)
570 B$=MID$(A$,K,1)
580 IF B$>="0" AND B$<="9" THEN DR
AW NU$(VAL(B$)):GOTO 610
590 IF B$=" " THEN N=0 ELSE N=ASC(
B$)-64
600 DRAW LE$(N)
610 NEXT
620 RETURN
630 PCLS3:SCREEN 1,0
640 XX=90:YY=30:A$="CAT":DRAW"C2S1
6":GOSUB 550
650 XX=100:YY=90:A$="AND":DRAW"C2S
8":GOSUB 550
660 XX=75:YY=150:A$="MOUSE":DRAW"C
2S16":GOSUB 550
670 FOR T=1 TO 4
680 PLAY"O1":FOR N=1 TO 4:PLAY"T25
5CDEFGABO+":NEXT N
690 NEXT T
700 FOR T=0 TO 200:NEXTT
710 PCLS3
720 XX=30:YY=30:A$="LEVEL":DRAW"C2
S16":GOSUB 550
730 SOUND 50,5:XX=30:YY=90:A$="LEV
EL":DRAW"C2S16":GOSUB 550
740 SOUND 100,5:XX=30:YY=150:A$="L
EVEL":GOSUB 550
750 SOUND 150,5
760 XX=200:YY=30:A$="1":DRAW"C2S16
":GOSUB 550:SOUND 100,2
770 XX=200:YY=90:A$="2":DRAW"C2S16
":GOSUB 550:SOUND 100,2
780 XX=200:YY=150:A$="3":DRAW"C2S1
6":GOSUB 550:SOUND 100,2
790 B$=INKEY$
800 IF B$="1" THEN W=30:CY=12:CX=1
2:MY=12:MX=12:GOTO 840
810 IF B$="2" THEN W=130:MY=12:MX=
12:CY=12:CX=12:GOTO 840
820 IF B$="3" THEN W=200:CX=24:CY=
24:MY=24:MX=24:GOTO 840
830 GOTO 790
840 PCLS:PUT(0,0)-(24,24),HO,PSET
850 PUT (180,0)-(204,24),HO,PSET
860 LINE(106,72)-(148,107),PSET,B
870 XC=10:YC=30
880 XM=178:YM=30
890 REM*****MAIN LOOP
900 PUT(10,30)-(34,54),CR,PSET
910 PUT(178,30)-(202,54),MR,PSET
920 FOR N=1 TO 26
930 B$="ABCDEFGHIJKLMNOPQRSTUVWXYZ
"
940 A$=MID$(B$,N,1)
950 XX=120:YY=82:DRAW"C3S16":GOSUB
 550
960 FOR Z=0 TO W
970 Z$=INKEY$
980 IF Z$=A$ THEN GOSUB 1290:GOTO
1010
990 IF Z$<>A$ AND Z$<>"" THEN GOSU
B 1070
1000 NEXT Z
1010 GOSUB 1070
1020 XX=120:YY=82:DRAW"C1S16":GOSU
B 550
1030 IF XM=XC AND YM=YC THEN 1580
1040 IF XM<178 AND XM>130 AND YM<3
5 THEN 1530
1050 NEXT N
1060 GOTO 920
1070 IF XM=XC AND YM=YC THEN 1580
1080 IF XC<=10 AND YC=30 THEN GOTO
 1120
1090 IF XC>=180 AND YC>=30 AND YC<
140  THEN GOTO 1170
1100 IF XC>=180 OR XC>=60  AND YC>
=140 THEN GOTO 1210
1110 IF XC<=60 AND YC>=140 OR YC>=
35  THEN GOTO 1250
1120 REM RIGHT
1130 PUT(XC,YC)-(XC+24,YC+24),BL,P
SET
1140 XC=XC+CX
1150 PUT(XC,YC)-(XC+24,YC+24),CR,O
R
1160 RETURN
1170 REM DOWN
1180 PUT(XC,YC)-(XC+24,YC+24),BL,P
SET
1190 YC=YC+CY:PUT(XC,YC)-(XC+24,YC
+24),CR,OR
1200 RETURN
1210 REM BACK LEFT
1220 PUT(XC,YC)-(XC+24,YC+24),BL,P
SET
1230 XC=XC-CX:PUT(XC,YC)-(XC+24,YC
+24),CL,OR
1240 RETURN
1250 REM UP LEFT
1260 PUT(XC,YC)-(XC+24,YC+24),BL,P
SET
1270 YC=YC-CY:PUT(XC,YC)-(XC+24,YC
```


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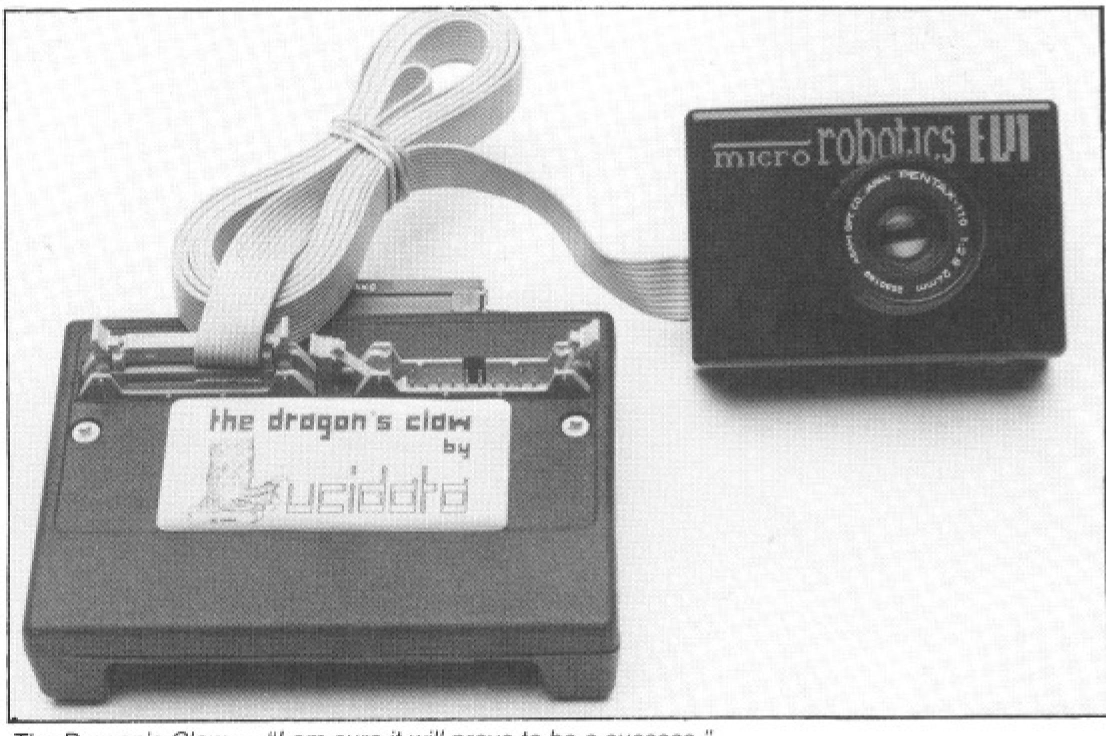
```
+24),CL,OR
1280 RETURN
1290 IF XM<=178 AND YM=30 THEN GOT
O 1330
1300 IF XM>=180 AND YM>=30 AND YM<
140 THEN GOTO 1380
1310 IF XM>=180 OR XM>=60 AND YM>=
140 THEN GOTO 1430
1320 IF XM<=60 AND YM>=140 OR YM>=
35 THEN GOTO 1480
1330 REM RIGHT
1340 PUT(XM,YM)-(XM+24,YM+24),BL,P
SET
1350 XM=XM+MX
1360 PUT(XM,YM)-(XM+24,YM+24),MR,P
SET
1370 RETURN
1380 REM DOWN
1390 PUT(XM,YM)-(XM+24,YM+24),BL,P
SET
1400 YM=YM+MY
1410 PUT(XM,YM)-(XM+24,YM+24),MD,P
SET
1420 RETURN
1430 REM LEFT
1440 PUT(XM,YM)-(XM+24,YM+24),BL,P
SET
1450 XM=XM-MX
1460 PUT(XM,YM)-(XM+24,YM+24),ML,P
SET
1470 RETURN
1480 REM UP
1490 PUT(XM,YM)-(XM+24,YM+24),BL,P
SET
1500 YM=YM-MY
1510 PUT(XM,YM)-(XM+24,YM+24),MU,P
SET
1520 RETURN
1530 XX=80:YY=10:A$="YOU ARE HOME"
:DRAW"C3S8":GOSUB 550
1540 PUT(XM,YM)-(XM+24,YM+24),BL,P
SET
1550 PLAY"O4V31T2L2CO-GL4GAL6GFL2E
C"
1560 PLAY"L4GAL6GFL2BL4GEFFL6FEL4D
L2C"
1570 GOTO 1600
1580 XX=60:YY=10:A$="MUNCH MUNCH":
DRAW"C3S8":GOSUB 550
1590 PLAY"O1V31T2L4GGL8GGL4B-AAGGF
+G"
1600 PCLS3:XX=40:YY=100:A$="PLAY A
GAIN  YES OR NO":DRAW"C2S8":GOSUB
550
1610 Q$=INKEY$:IF Q$="Y" THEN 710
1620 IF Q$="N" THEN END
1630 GOTO 1610
```

The Dragon's Claw

***Roy Coates** looks at an interesting new development in Dragon peripherals*

THE DRAGON'S CLAW is one of the many hardware add-ons that should have appeared a couple of years ago. If it had then the Dragon may have enjoyed a far more interesting and widespread user base than it currently does.

The Claw is a standard sized cartridge which has three sockets protruding from it. There are two on the top of the cartridge, the first being an eight-bit Centronics I/O port, and the second being an emulation of the BBC computers "User Port". The third connector is something that should be found on a lot more of the add-ons on the market. It is simply an extension of the Dragon's cartridge port which allows another cartridge such as another Claw or a disk interface to remain connected to the Dragon whilst the Claw is in use. With this in mind, the Claw has been designed in such a way that it may be configured to reside in one of four different places within the Dragons address space. Although none of these addresses are known to conflict with those used by other cartridge add-ons, it does mean that up to four Claws may be connected together.



The Dragon's Claw — "I am sure it will prove to be a success."

Heart

The heart of the Dragon's Claw is the tried and tested Rockwell 6522 Versatile Interface Adaptor (VIA). This is a very clever device which may be set up to handle just about any type of I/O that may be required. As mentioned in the Claw manual, it would take many reams of paper to illustrate all of the possible applications of the 6522 VIA and so a brief description of the device will have to suffice. The 6522 contains 16 eight-bit registers and these are individually addressable through four address lines on the chip. Address decoding is provided within the cartridge to allow the placing of the cartridge at the four different addresses as mentioned above.

The documentation that is supplied with the Claw consists of the now standard A5 sized booklet and contains a description of the Claw along with a programming example and the Data sheet for the VIA chip.

With the software to support it, the Claw may be used to drive all the wonderful peripherals that have appeared. for the BBC micro such as the Penman plotter, Robot arms and the Snap-Camera pictured here. Programming the Claw to interface to other devices does require a basic knowledge of interfacing, but an example is provided and would give a good starting point for someone interested in this often fascinating facet of computing.



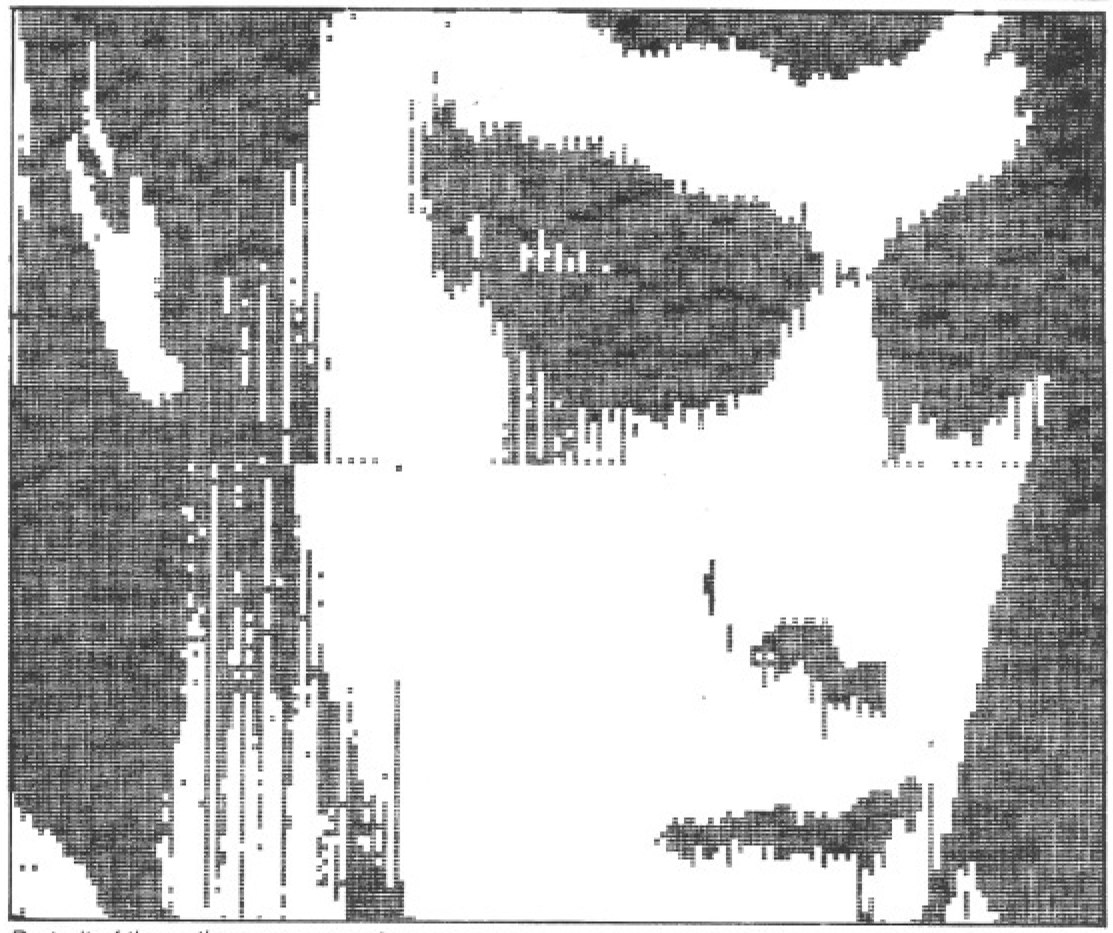
The Snap-Camera is surprisingly small, fitting in a plastic case measuring only 3" × 2" × 1" and is fitted with a small 24mm Pentax lens. A tripod mounting bush has thoughtfully been provided although it will require a longer than average mounting bolt as the bush is recessed into the case. A length of ribbon cable about six feet long is used to connect the camera to the Dragon's Claw and the plug is a very tight fit against the side of the Dragon. Although Lucidata assure you that this is intentional, I must admit to being a little wary when moving the camera about in case the cable should snag on something and pull the cartridge out. It didn't and I was not prepared to see how hard you had to pull to find out!

The demonstration software provided with the camera is on cassette although instructions are given for saving this to disk. The program consists of a BASIC program and one machine code program. A source listing of the machine code is given in the manual with descriptions of all the routines and how to implement them in your own programs.

Having loaded the software, the camera worked straight away and I was a little surprised at seeing myself appear on the

computer screen. (If you have seen "Tron" you will understand why!) The demo program is in three parts, the first part will display a picture as seen by the camera and will calculate an average exposure to build up the image on the screen. The second part of the program allows you to alter the exposure time manually which does give a lot more scope to the final picture quality, and the final part of the demo performs a colour enhancement of the last exposure as used in many scientific applications to enhance certain areas of the picture.

Having quickly experimented with varying objects, it was found that the camera has a particularly narrow field of vision and is best using objects no more than about four feet away. Strong lighting tends to "bleach" the image, thus losing a lot of the detail. The light from a normal 60 watt domestic bulb was found to be about the best source of light. The quality of the picture obtained varies enormously depending on the content. Items which have a great deal of contrast such as a newspaper or a cartoon appear far more clearly than would a coloured object. As mentioned in the camera manual, the Optical RAM is particularly sensitive to the colour red, and so anything that is red tends to come out as if it was pure white.



Portrait of the author as a computer screen.

Beastie

Lucidata have already released the Snap-Dragon camera with software to drive the unit through the Dragon's Claw and now have a "Beasty" robot arm working happily. They will be demonstrating this at the forthcoming 6809 show. Future devices may include some of the turtles available for the BBC micro and possibly a home satellite weather station. Obviously this will depend on the market response to this product but the Claw is the key that opens up so many doors as far as add-ons go that I am sure that it will prove to be a success.

Over the next few weeks I shall be trying the Claw with a commercial robot arm, and I shall also be trying some of the suggested applications for the camera in the camera manual. Watch this space!!

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Competition Corner

Answers to Competition Corner, *Dragon User*, 12-13 Little Newport Street, London WC2H 7PP.

THE GAME of Nim is one of the oldest games for two players, and certainly it or a variation is to be found in most countries and cultures. Nim is a game that can be played using the simplest of materials such as pebbles on the beach or coins on the table. It can also be adapted for playing by computer.

The rules of the game are simple. Several pebbles are laid out in a number of rows and players take it in turns to remove one or more pebbles. The only limitation is that at each go the pebbles must all come from the same row. The winner is the player to take the last pebble.

For example, in the game below a player could remove either one, two, three, or four pebbles from row 'A', *or* either one or both pebbles from row 'B', *or* he might elect to remove from one to all seven pebbles from row 'C'.

A ☆ ☆ ☆ ☆
B ☆ ☆
C ☆ ☆ ☆ ☆ ☆ ☆ ☆

In fact, the only safe move would be to take just one pebble from row 'C'. Unfortunately space doesn't permit a full discussion as to *why* this should be so, but readers who are interested might get some clue from analysing the program given below and seeing how the computer decides on its best move. That this method is related to the binary method of counting might suggest why the game of Nim is suited to computer analysis. Indeed a machine called the 'Nimatron' was built by the Westinghouse Electric Corporation and exhibited in New York in 1940. This machine weighed a ton and was limited to playing with only four rows with a maximum of seven 'pebbles' in each. The version for the 'Dragon' given here adds variety to the game by generating a random number of rows with up to 30 'pebbles' in each row. You will find that as the computer prints out the 'pebbles', each block of five is in a different colour. This has no significance relating to the game and is done simply to make counting the pebbles in each row easier.

Have a happy Christmas!

For the Christmas Competition we are turning to the adventures of the well-known anthropologist and explorer, Ms Symphyta Offen-Knightly who has just returned from the remote East European country of Pandemonia.

This country is so remote that the conventional arabic system of numbers is still unknown. Instead of using the 10 digits which we recognise as zero to nine, the Pandemonians use 10 written symbols which bear a striking resemblance to our letters A, B, C, D, E, F, G, H, I and J (though not necessarily in this order).

Not surprisingly books of mathematical tables are on sale in the local shops, and Ms O-K, mistaking one for an English/Pandemonian phrase book, caused a great deal of confusion by reciting from a page of square numbers. This is perhaps understandable if it is realised that amongst this table of squares in the notation of Pandemonia are the words HAD, CABBAGE, and DEFIED.

Can you determine which letter represent which digits?

```
100 DIM L(7),B$(7),C$(7):MO=1:QQ=0
110 CLS:PRINT@128,"ENTER DIFFICULTY FACTOR (1 TO 9)"
120 PRINT @200,"(1=EASY  9=HARD)"
130 A$=INKEY$:X=RND(9):IF A$=""THEN 130
140 ROWS=RND(5)+2:FOR F=1 TO ROWS:L(F)=RND(30):X=L(F)
150 QQ=QQ+L(F):GOSUB470:B$(F)=X$:NEXT F
160 CLS0:FOR F=1 TO ROWS:PRINT @(F+1)*32,CHR$(F+96);
170 IF L(F)<1 THEN B$(F)="00000":GOTO190
180 FOR D=1 TO L(F):SET(D*2+2,F*2+3,2+INT((D-1)/5)):NEXT D
190 NEXT F:IF QQ<1 THEN 430
200 IF MO=-1 THEN MO=MO*-1:GOTO280
210 PRINT@416,STRING$(32,32);:PRINT STRING$(32,32);
220 PRINT@418,"WHICH ROW";:INPUT R$
230 R=ASC(R$)-64:IF R>ROWS OR R<1 THEN 210
240 PRINT@451,"HOW MANY";:INPUT N
250 IF N<1 OR N>L(R)THEN210
260 L(R)=L(R)-N:QQ=QQ-N:MO=MO*-1
270 FOR F=1 TO ROWS:X=L(F):GOSUB470:B$(F)=X$:NEXT F:GOTO160
280 FOR F=1 TO ROWS:C$(F)=B$(F):NEXT F:IF VAL(A$)<RND(9)THEN 450
290 FOR F=1 TO ROWS:IF L(F)=0THEN 370
300 FOR P=L(F)-1 TO 0 STEP-1
310 X=P:GOSUB 470:C$(F)=X$
320 FOR D=5 TO 1STEP-1:S=0:FOR C=1 TO ROWS
330 S=S+VAL(MID$(C$(C),D,1)):NEXT C
340 IF S=1 OR S=3 OR S=5 OR S=7 THEN360
350 NEXT D:GOTO 380
360 X=L(F):GOSUB 470:B$(F)=X$:C$(F)=X$:NEXT P
370 NEXT F:GOTO 450
380 MV=L(F)-P:L(F)=P
390 L$=CHR$(64+F)
400 PRINT@416,STRING$(32,32);:PRINT STRING$(32,32);
410 PRINT@418,"I WILL TAKE";MV;" FROM ROW ";L$
420 FOR KK=1 TO 2000:NEXT KK:QQ=QQ-MV:GOTO 160
430 IF MO=1 THEN PRINT@460,"I WIN!"; ELSE PRINT@459,"YOU WIN!";
440 FOR TT=1 TO 3000:NEXT TT:RUN
450 F=RND(ROWS):IF L(F)<1THEN450
460 MV=RND(L(F)):L(F)=L(F)-MV:GOTO 390
470 X$=""
480 IF X/2=INT(X/2)THEN X$="0"+X$ ELSE X$="1"+X$
490 IF X>1 THEN X=INT(X/2):GOTO 480
500 IF LEN(X$)<5 THEN X$="0"+X$:GOTO 500
510 RETURN
```

Prize

THIS MONTH we have a special prize, one of the latest, and perhaps best games for the Dragon. Microdeal have kindly agreed to donate 20 copies of *Trekboer*, their latest graphic adventure — and if you want to find out just how good it is, turn to the reviews pages where Mike Gerrard gives it the once over.

Rules

TO WIN a copy of *Trekboer*, you must first show the answer to the above problem, and, secondly, demonstrate how you solved it with the use of a Basic program written on your Dragon.

Please do not send in a cassette containing your answer.

Make sure your name and address is printed clearly on your entry and mark the envelope December competition. Envelopes which do not say which month you are entering will be disqualified.

As a tie-breaker, complete the following sentence in 10 words or less: "I want to visit a Dark Star because . . ."

Entries must reach *Dragon User* by the last working day in December. The winners will be announced in the March 1986 issue. The editor's decision is final and no correspondence will be entered into.

WINNERS

IT NEVER ceases to amaze us — every month, people win prizes! And September was no different.

The following clever 15 have managed to get themselves copies of both *Chuckie Egg* and *Screaming Abdabs* from A'n'F Software. They are: Richard Byrne of Drumcondra, Eire, Peter Cutting of Putney, E Newman of Addlestone, D Medrow of Storrington, M Stonton of Stoke Bruerne, Karen Money of Hereford, R Lawson of Kettering, G Hunt of Bolton-le-Sands, C Jones of Llanerch, Luis Martinez of San Sebastian, Spain, R. Hart of Knutsford, Kevin Desmond of Cork, Eire, Olav Friis Nielsen of Rulkedalen, Norway, Rachel Edmunds of Sedgefield, and Keir Healey of Rugby.

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Dragon 32 actual screen shots